



# Capital Investment Program



## FY2001-FY2006

① Massachusetts Bay Transportation Authority

Argo Paul Cellucci, Governor

Jane Swift, Lieutenant Governor

Kevin J. Sullivan, Secretary & MBTA Chairman

Robert H. Prince, Jr., General Manager

DRAFT  
Fall 2000

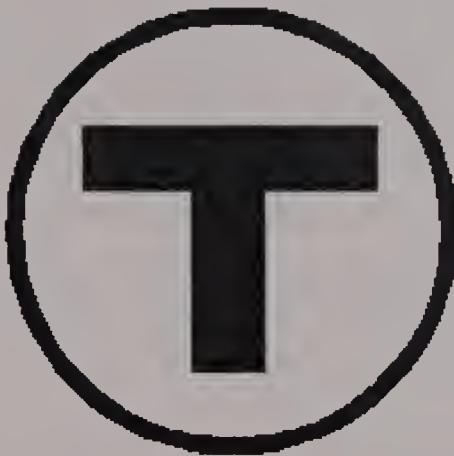


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*Moving People-  
100 Years of Pride and Progress*

*Mission Statement*

Committed to excellence, the MBTA strives to provide safe, accessible, dependable, clean and affordable transportation to our valued customers, through the dedication of our diverse and talented workforce.

*Robert H. Prince Jr.*

Robert H. Prince, Jr.  
General Manager

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388.4  
mA





# Massachusetts Bay Transportation Authority

Argeo Paul  
Cellucci  
Governor

Jane Swift  
Lieutenant  
Governor

Kevin J. Sullivan  
Secretary and MBTA  
Chairman

Robert H. Prince, Jr.  
General Manager

November 9, 2000

Dear Reader,



It is the MBTA's mission to provide safe, accessible, dependable, clean and affordable transportation throughout our service area. Fulfilling that mission for over 100 years, the MBTA has built, operated and maintained an extensive network of light rail, rapid transit, buses, commuter rail, paratransit and ferries. And, we have been successful! Today, the Authority moves in excess of 1.2 million passengers on a daily basis.

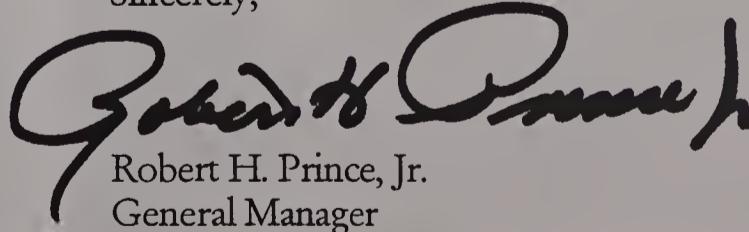
After a thoughtful review, the Authority makes investment decisions and programs them in its capital plan. To maintain its system in a state of good repair, the MBTA must continually and adequately invest in its infrastructure. In addition, to ensure that sufficient capacity exists for future passenger growth, the MBTA must also provide for necessary expansion projects.

I am publishing this Capital Investment Program (CIP) to provide an understanding of the Authority's planned capital expenditures as well as present a preview of the MBTA's future capital needs. The intent is to present the reader with a resource guide to the MBTA's capital program, which is easy to understand and follow.

In 1997, the MBTA celebrated its 100<sup>th</sup> year of providing subway service. In planning capital investment in the new millennium, the MBTA will continue to emphasize improving service for the riding public. To ensure that the second century of MBTA service is as successful as its first, the CIP invests in the existing infrastructure and allows for a moderate amount of expansion of the core system.

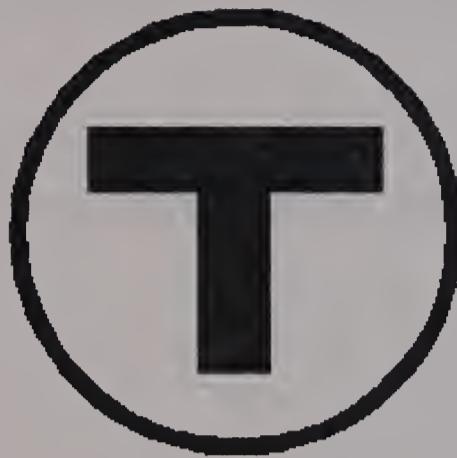
I'll see you on board!

Sincerely,

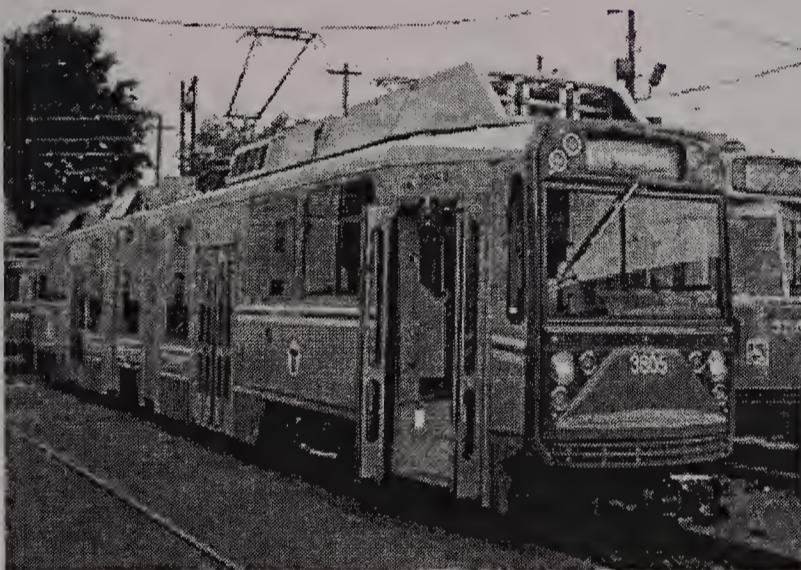


Robert H. Prince, Jr.  
General Manager





# Capital Investment Program FY2001 – FY2006





## TABLE OF CONTENTS

I. INTRODUCTION.....	I-1
II. THE FY01 TO FY06 CAPITAL INVESTMENT PROGRAM	
A. REVENUE VEHICLES.....	II-1
SUBWAYS.....	II-3
COMMUTER RAIL.....	II-7
SILVER LINE.....	II-11
BUS .....	II-13
B. NON REVENUE VEHICLES .....	II-17
SUBWAY .....	II-19
COMMUTER RAIL.....	II-21
SYSTEMWIDE.....	II-23
C. TRACK/RIGHT OF WAY.....	II-25
SUBWAY .....	II-27
COMMUTER RAIL.....	II-31
D. SIGNALS .....	II-35
SUBWAY .....	II-37
COMMUTER RAIL.....	II-41
E. COMMUNICATIONS.....	II-43
F. POWER.....	II-47
SUBWAY .....	II-49
COMMUTER RAIL .....	II-53
SYSTEMWIDE .....	II-55
G. MAINTENANCE FACILITIES .....	II-57
SUBWAY .....	II-59
COMMUTER RAIL.....	II-61
BUS .....	II-63
SYSTEMWIDE.....	II-65
H. STATIONS .....	II-67
SUBWAY .....	II-69
COMMUTER RAIL.....	II-71
SILVER LINE .....	II-73
BUS .....	II-75

## TABLE OF CONTENTS CONT.

<b>I. FACILITIES .....</b>	<b>II-77</b>
SUBWAY .....	II-79
COMMUTER RAIL.....	II-81
SYSTEMWIDE .....	II-83
TUNNELS, WALLS, CULVERTS .....	II-85
<b>J. BRIDGE AND VIADUCTS .....</b>	<b>II-87</b>
<b>K. FARE EQUIPMENT .....</b>	<b>II-91</b>
<b>L. ACCESSIBILITY .....</b>	<b>II-93</b>
<b>M. SYSTEM ENHANCEMENT.....</b>	<b>II-95</b>
SUBWAY .....	II-97
COMMUTER RAIL.....	II-99
BUS .....	II-101
SYSTEMWIDE .....	II-103
PARKING ENHANCEMENT .....	II-105
ENVIRONMENTAL COMPLIANCE .....	II-107
<b>N. SYSTEM EXPANSION.....</b>	<b>II-109</b>
SUBWAY .....	II-111
COMMUTER RAIL.....	II-113
SILVER LINE.....	II-115
BUS .....	II-117
STUDIES/DEVELOPMENT .....	II-119
<b>O. ADMINISTRATION/OTHER.....</b>	<b>II-121</b>

CELEBRATING 100 YEARS OF SERVICE



1897 • AMERICA'S FIRST SUBWAY • 1997





The Massachusetts Bay Transportation Authority (MBTA) created the Capital Investment Program (CIP) to provide an understanding of the Authority's planned capital expenditures for the current year and a five-year planning horizon as well as to outline the need for future capital investment. The program bundles like capital efforts together into structured projects and further into programmatic areas. The intent is to provide the reader with an easily understood and followed resource guide to the MBTA's capital program.

## **THE MASSACHUSETTS BAY TRANSPORTATION AUTHORITY**

In 1897, America's first subway was constructed between Park and Boylston Street stations. This ½-mile section of subway is still operated today by the MBTA, and is the oldest continuously operating subway system in the country. In the 103 years since this service opened, Boston's public transportation system has grown in response to an ever-increasing demand for transportation services. The MBTA now serves more than 175 communities, providing transit alternatives for a population of about 2.8 million people over an area of 1,038 square miles.

Currently, the MBTA is the fourth largest mass transit system in the United States by ridership. It serves a daily ridership of approximately 1.2 million passengers. To provide these services, the Authority maintains 159 bus routes, 4 rapid transit lines, 4 streetcar routes, 4 trackless trolley lines, and 11 commuter rail lines. Its roster of equipment currently consists of 408 rapid transit vehicles, 181 light rail vehicles, 978 buses, 4 prototype alternative fuel buses, 41 trackless trolleys, 80 commuter rail locomotives, 362 commuter rail coaches, and 426 "RIDE" vehicles. Service is provided to 248 stations. System expansion efforts over the next five years will bring 17 new stations into service, including three on the Worcester line, one on the Old Colony line, 4 stations on the Greenbush Line and 13 on the new Silver Line.

A nine member Board of Directors manages the affairs of the Authority. The Secretary of the Executive Office of Transportation and Construction of the Commonwealth serves as the Chairman of the Board. The Governor of the Commonwealth appoints the other eight directors. The Board has the power to appoint and employ a General Manager and other officers. The Board also authorizes all capital program actions above \$250,000. An Advisory Board, consisting of a representative of each of the cities and towns constituting the Authority's service districts, approves the Authority's annual operating budget and reviews the Authority's long-term capital program.

## **OVERVIEW OF THE MBTA TRANSPORTATION SYSTEM**

### **Rapid Transit System**

The Authority operates over 46 miles of rapid transit rail routes. Three separate rapid transit rail lines (the Red, Orange and Blue Lines) serve 53 stations. Service is also provided by streetcars and light rail vehicles on 33 miles of additional rail routes (the Green Line and the Mattapan Line) serving 78 fixed stations.

### **Commuter Rail Service**

The Authority operates over 400 units of passenger rail equipment (including locomotives and coaches) providing commuter service to and from 125 outlying rail stations and downtown Boston on 11-commuter rail lines. Commuter rail service is provided throughout much of the MBTA's service area and to over 50 communities outside the area.

## Bus Service

The Authority owns 1,023 buses and trackless trolleys that operate on 159 bus routes and cover a total route mileage of about 710 miles. In addition to local services, the Authority operates a frequent schedule of express buses to and from downtown Boston and surrounding communities. The Authority also manages six local service subsidy programs that provide intracommunity and feeder services.

## Other Services

A special program, the "RIDE," owns and operates 426 vehicles. The "RIDE" serves the elderly and disabled, making approximately 100,000 trips per month for work, medical treatment, social functions and shopping. The MBTA also operates commuter boat service between Boston and various points in Boston Harbor, as well as Hingham Harbor.

## MBTA CAPITAL INVESTMENT PROGRAM

The MBTA's FY01-FY06 Capital Investment Program totals approximately \$2.91 billion or an average of \$485 million per year over the duration of this program.

Responsibility for management of the capital program is dispersed throughout the Authority. The Design and Construction Directorate oversees the construction of stations, track, signals, communications, bridges, tunnels and other infrastructure projects as well as ensuring compliance with environmental regulations. The Planning Department is responsible for studying future expansion concepts. The Operations Directorate has primary responsibility for vehicle purchases and the MBTA's electric power generation, transmission and distribution system. The Financial Directorate is responsible for cash flow, grant management, debt issuance and expenditure tracking. Various administrative departments share responsibility for the balance of the capital program.

To address the fact that no one department or individual had overall responsibility for the capital program, in 1998, the General Manager created the Capital Management Group (CMG) and a new department called Capital Management.

## The Capital Management Group

The goal of the MBTA's capital management program is to maintain the transit infrastructure in a state of good repair and to provide for prudent expansion of service. To overview the capital program, the General Manager created the Capital Management Group (CMG). The CMG consists of the Chief Operating Officer, the Chief of Staff, the Chief Financial Officer, the Chief of Design and Construction, the Chief of Employee Relations and Administration, the Director of Planning and the Director of Capital Management. The CMG, with oversight by the General Manager, is responsible for capital project budgets, scopes and key management decisions.

The MBTA pursues capital management using the following:

**Program Management:** Use of an objective and consistent decision making process to review capital new needs based on the criteria of safety, state of good repair, enhancement and expansion.

**Project Management:** The monitoring and management of capital projects through quarterly reports on each individual project and through reviews by the Authority's independent engineers program.

**State of Good Repair:** Identification and prioritization of outstanding infrastructure needs through an on-going systemwide condition assessment and development of an interactive database, which will assist decision-makers in the allocation of capital resources.

**Strategic Capital Planning:** the management of resources to meet both long and short-term needs through the Program for Mass Transit (PMT) and the CIP.

## FUNDING THE MBTA CAPITAL INVESTMENT PROGRAM

### Forward Funding

In 1964 the MBTA's original enabling legislation provided various forms of financial assistance from the Commonwealth to offset the MBTA's operating deficit. Such financial assistance was paid in arrears upon certification by the MBTA to the Commonwealth. In order to finance its capital program, the MBTA was authorized to issue indebtedness secured by its general obligation. If the MBTA lacked funds to pay such indebtedness, the Commonwealth was obligated to pay such amount, to which obligation the Commonwealth's full faith and credit was pledged (the "Commonwealth Guaranty").

As part of its fiscal year 2000 Annual Appropriations Act, the Commonwealth repealed and restated the MBTA's original enabling legislation (the "Enabling Act"). Effective July 1, 2000, the MBTA receives a dedicated revenue stream consisting of assessments paid by the 175 cities and towns in the new MBTA district established by the Enabling Act (the "Assessments") and the greater of the amount raised by 1% of an existing statewide sales tax and \$645 million subject to upward adjustment under certain circumstances set forth in the Enabling Act (the "Dedicated Sales Tax" and, together with the Assessments, the "Dedicated Revenues"). The Enabling Act and the new financing mechanism for the MBTA established thereunder have been referred to as "Forward Funding" to reflect the fact that the MBTA's costs will no longer be funded in arrears.

The MBTA's capital program is funded by three major sources: revenue bonds, pay-as-you-go capital funding and federal grants. Prior to Forward Funding, the MBTA's non-federal portion of the capital program was funded by General Transportation Revenue Bonds issued by the MBTA and supported by the Commonwealth Guaranty. Under Forward Funding the MBTA's share of the capital program will be primarily funded in the early years by revenue bonds secured by the Dedicated Revenues under two separate credits. Assessments bonds will be generally secured by the Assessments paid by the 175 cities and towns and sales tax bonds will be generally secured by the Dedicated Sales Tax.

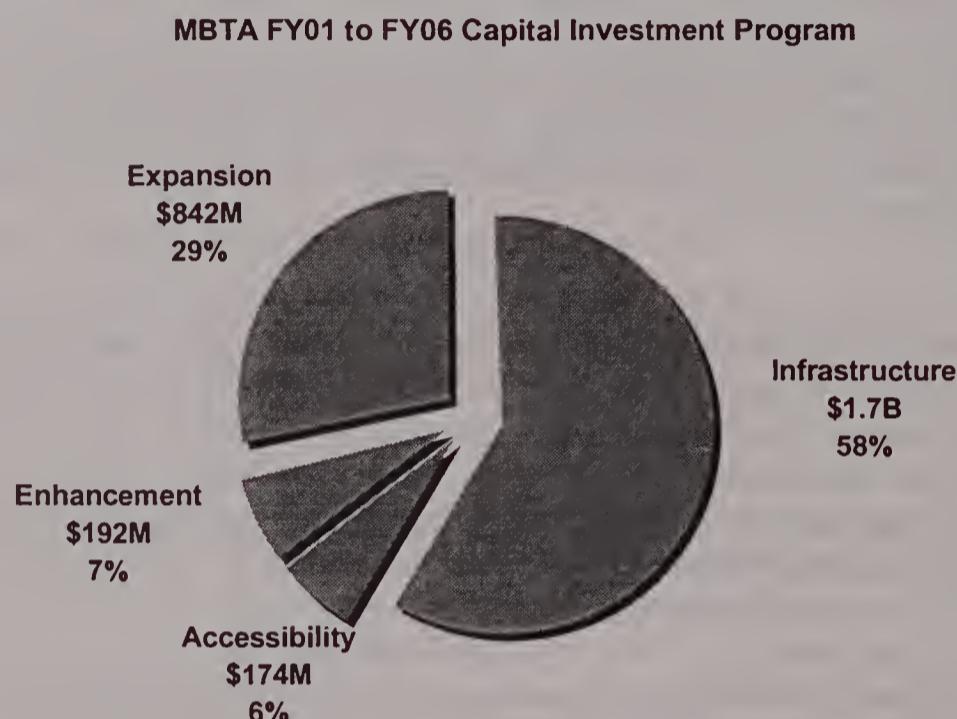
Because rising interest payments on debt would eventually threaten the MBTA's financial integrity, the MBTA is transitioning from complete reliance on debt financing to greater use of pay-as-you-go financing of capital projects. The transition from debt financing to pay-as-you-go capital funding will take time and discipline and depends, to some extent, on factors beyond the MBTA's control (e.g., the growth in future sales tax collections).

### Federal Grants

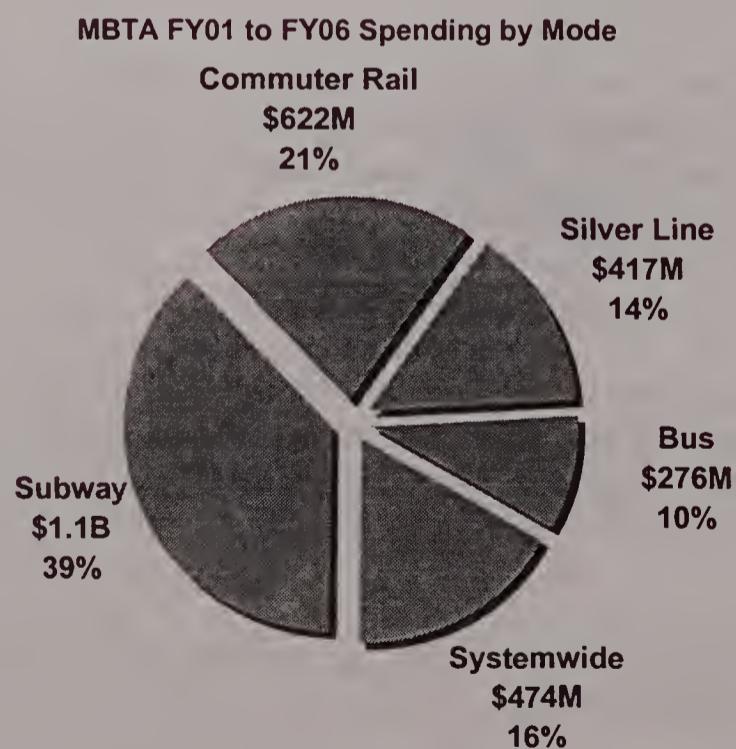
For the six-year period Fiscal Year 2001-2006, the MBTA's anticipates that approximately \$1.6 billion of revenues bonds will be issued to fund MBTA capital expenditures, approximately \$1.1 billion of capital expenditures will be funded through federal grants and approximately \$38 million of capital expenditures will be funded with pay-as-you-go capital funding.

## SUMMARY OF THE FY01 TO FY06 CAPITAL INVESTMENT PROGRAM

The FY01 to FY06 Capital Investment Program is broken down into four major programmatic areas: 1) reinvestment in the infrastructure; 2) accessibility improvements; 3) enhancement of existing service; and 4) system expansion efforts. The MBTA has programmed a total of \$2.91 billion over the FY01-FY06 period. The graph below represents the Authority's percentage spending per programmatic area:



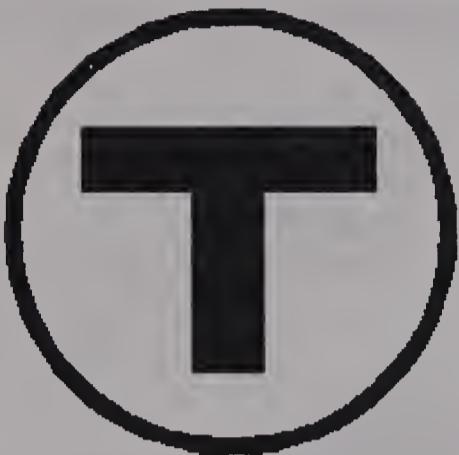
Each section of the FY01 to FY06 CIP is divided into the five modes of service provided by the Authority: 1) subway; 2) commuter rail; 3) the new Silver Line; 4) buses; and 5) systemwide. The spending per mode is shown in the chart below:



The CIP further groups anticipated expenditures into 15 smaller programmatic areas by mode as shown on the chart below. Under each mode and programmatic area, the plan provides detail on the specific assets that must be maintained. In addition, the chart lists the current level of program funding for each area and the relative percentage of each area's funding when compared to the entire FY01 – FY06 investment program.

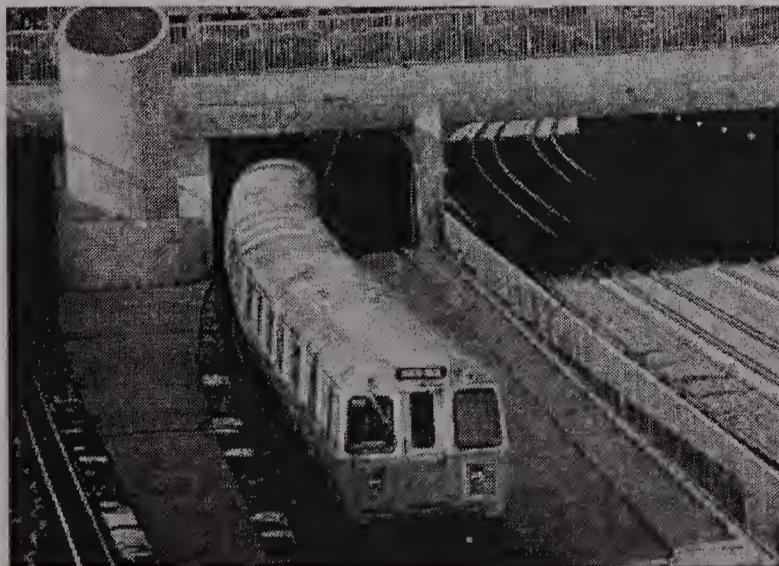
PROGRAM AREA	PROGRAM OVERVIEW	MODES	FY01-FY06 FUNDING (in \$ mil.)	Percent of FY01 to FY06 Program
INFRASTRUCTURE				
Revenue Vehicles	Includes all vehicles used to carry passengers in revenue service.	Subway, Commuter Rail, Silver Line, Bus	\$689.1	23.7%
	Includes vehicles used to maintain the system and to support system administration.	Subway, Commuter Rail, Systemwide	\$0.0	0.0%
	Includes infrastructure within the right-of-way such as track and ballast.	Subway, Commuter Rail	\$147.4	5.1%
	Includes all elements of the rail signaling systems.	Subway, Commuter Rail	\$190.6	6.6%
	Includes telecommunications, systemwide radios and Operations Control.	Systemwide	\$65.9	2.3%
	Includes the network to provide traction power to the rail system, as well lighting and other electrical elements.	Subway, Commuter Rail, Systemwide	\$28.9	1.0%
	Includes the rail car houses and bus garages where vehicle maintenance is performed.	Subway, Commuter Rail, Bus, Systemwide	\$115.4	4.0%
	Includes the subway and surface stations where passengers board MBTA vehicles.	Subway, Commuter Rail, Silver Line, Bus	\$281.6	9.7%
	Includes administrative buildings and other structures needed to support transit services.	Subway, Commuter Rail, Systemwide, Tunnels, Walls, Culverts	\$28.3	1.0%
	Includes all bridges maintained by the MBTA, including some that carry autos over MBTA right-of-way.	Systemwide	\$15.6	0.5%
Fare Equipment	Includes all infrastructure associated with the collection of MBTA revenues.	Systemwide	\$120.7	4.2%
ACCESSIBILITY	Encompasses actions that make accessibility improvements to MBTA stations and vehicles.	Systemwide	\$174.0	6.0%
SYSTEM ENHANCEMENT	Encompasses capital improvements that enhance service on the existing MBTA system.	Subway, Commuter Rail, Bus, Systemwide, Parking, Environmental Compliance	\$192.2	6.6%
SYSTEM EXPANSION	Encompasses the development, conceptual planning and construction of any effort to expand the scope of MBTA services.	Subway, Commuter Rail, Silver Line, Bus, Studies/Development	\$842.0	29.0%
ADMINISTRATION/OTHER	Includes the infrastructure, such as computers, that are needed to support the provision of MBTA service, as well as other services that support the capital program.	Systemwide	\$14.9	0.5%





# **Capital Investment Program**

## **FY2001 – FY2006**





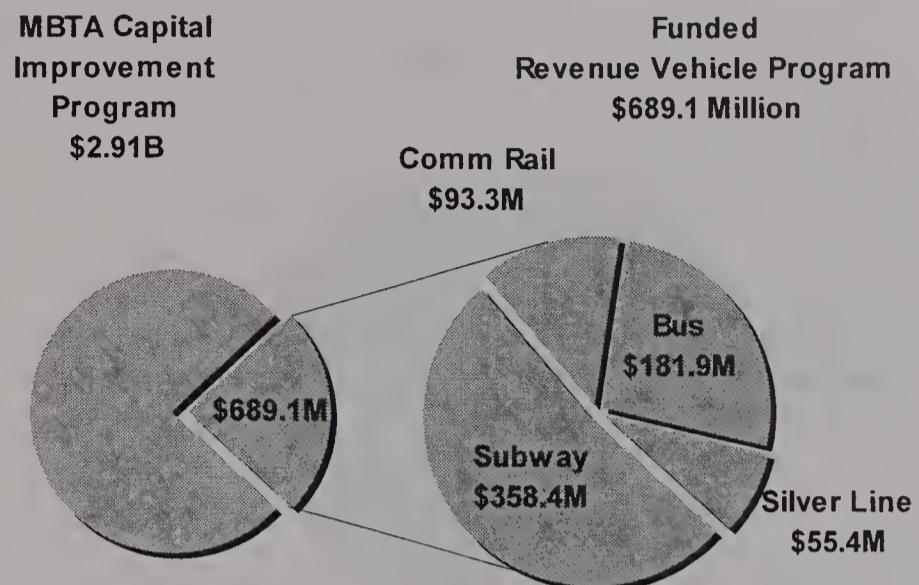


## PROGRAM OVERVIEW

The revenue vehicle fleet is one of the most visible and important components of the MBTA service network. The MBTA's fleet of revenue vehicles is composed of:

- 408 rapid transit vehicles serving the Red, Orange and Blue Lines
- 181 light rail vehicles serving the Green Line
- 362 commuter rail passenger coaches
- 80 commuter rail locomotive units
- 978 diesel motor bus coaches
- 4 prototype alternative fuel buses
- 41 electric trackless trolleys
- 426 RIDE vehicles

The MBTA adheres to a general standard lifecycle of 35 years for rapid transit vehicles, 25 years for commuter rail locomotives, 25 to 30 years for commuter rail coaches and 15 years for buses. The condition of each vehicle fleet is generally dependent on age, with several of the older fleets in need of major component replacements, overhauls and, in some cases, replacement. Without scheduled overhauls and planned retirements, the MBTA revenue vehicle fleet would experience unwarranted consumption of resources to maintain the existing fleet in operation and to maintain service reliability.



The current program devotes \$689.1 million toward revenue vehicles. The revenue vehicle program represents 23.7% of the total capital investment program and is composed primarily of reinvestment in the subway system. Major efforts in this program include new fleet procurements on the Green and Blue Lines and major component replacements on the Green, Orange, and Red Lines. Due to the need to replace up to 380 aging buses purchased between 1984 and 1987, the bus program also represents a relatively significant portion of the vehicle program.

Activity within the commuter rail vehicle program includes major efforts such as midlife overhauls for portions of the locomotive fleet. It is anticipated that in the future, commuter rail fleet needs will represent a more significant portion of the capital investment program.

Finally, the anticipated implementation of Silver Line service in 2001-2002 is reflected in the \$55.4 million programmed to acquire this new fleet.





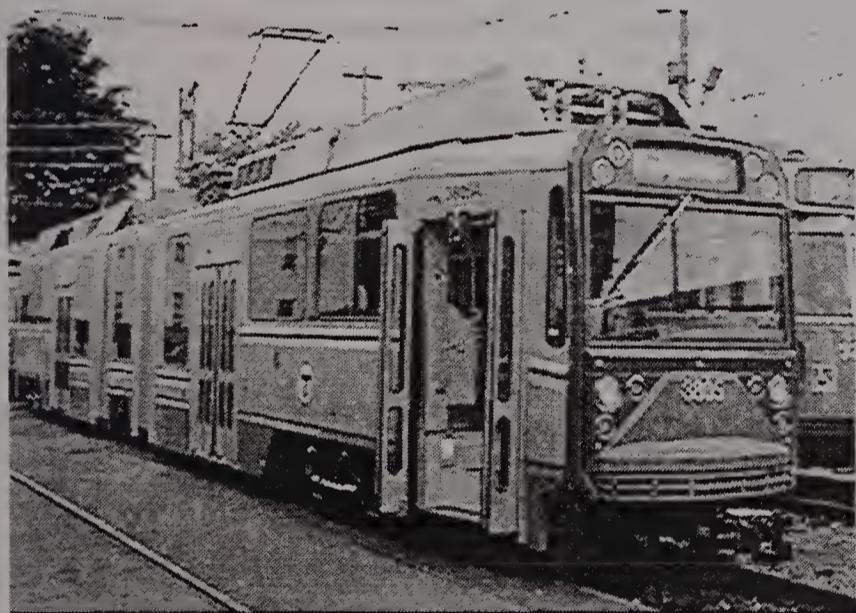


## REVENUE VEHICLES SUBWAY

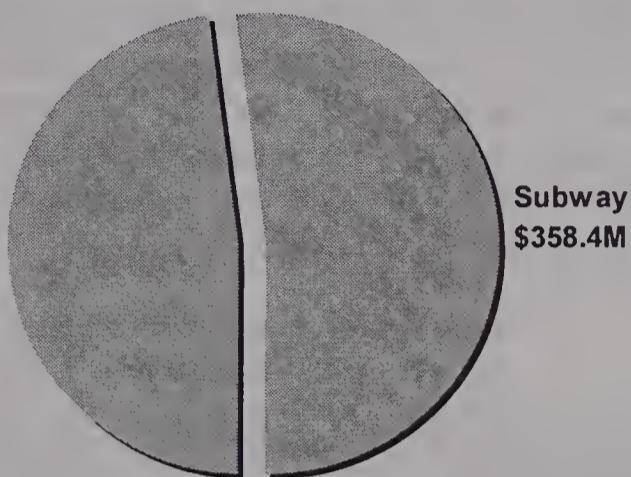
Funded Revenue Vehicles Program = \$689.1 Million

The MBTA subway system consists of three rapid transit lines and one light rail line, each with a distinct fleet. The details of each fleet are below (with acquisition dates for each fleet indicated in parenthesis).

- There are 218 Red Line cars made up of three separate series of cars: 74 No. 1 cars (1969), 58 No. 2 cars (1988) and 86 No. 3 cars (1994). Preventive maintenance inspections are mileage based and occur on an 8,500-mile interval for the No. 1 and No. 2 cars and 10,000 miles for the No. 3 cars.
- The Blue Line fleet is comprised of 70 No. 4 cars (1979). The development of specifications for a replacement fleet was initiated in FY99. Preventative maintenance inspections are done on each car approximately once a month.
- The Orange Line fleet consists of 120 No. 12 series cars (1981). The acquisition of new Blue Line cars will enable up to 24 of the existing Blue Line vehicles to be transformed for Orange Line service. Preventive maintenance inspections are time-based and occur on a 90-day interval.



Other Funded  
Revenue  
Vehicles  
Program



- There are 181 Green Line light rail vehicles (LRV) with three separate series of cars: 55 Boeing LRVs (1976-1983), 115 No. 7 cars (1986-88, 1997), and 11 active PCC Cars (1945-1946), which is the oldest fleet on MBTA property. The procurement of 100 No. 8 vehicles is currently underway and will enable the retirement of the 55 Boeings fleet, thus increasing the fleet by 45 vehicles. Over the next two years, No. 8 vehicles will have been acquired and in use along the Green Line. Preventive maintenance inspections are mileage based for the Boeing LRVs and the No. 7 cars. The Boeing LRVs have a light inspection every 4,500 miles and a heavy inspection at 9,000 miles. The No. 7 cars are inspected at 5,500-mile intervals. The PCC cars are inspected on a 30-day basis.

Subway rolling stock generally has a useful life cycle of 35 years or more. However, due to the salt-air environment in which it operates, the Blue Line No. 4 cars are not scheduled to operate beyond a useful life of 27 years. The MBTA subscribes to a philosophy of on-going preventative maintenance for light rail and heavy rail vehicles. This approach keeps the vehicles safe and reliable at a reasonable cost. Preventative maintenance will be needed for repairing major components such as floors, pantographs, couplers, or overhead blower motors.

The current program devotes \$358.4 million toward the subway vehicle program. This represents 52.0% of the total revenue vehicle program. The majority of the subway vehicle program is designated for the procurement of the new cars for the Green and Blue Lines. Other efforts include component replacements for the Red, Orange and Green Line fleets.

## **FUNDED PROJECTS: FY01 – FY06**

There are twelve approved projects related to subway vehicles. All of the projects listed below (with the exception of the Green Line No. 8 and the new Blue Line procurements) represent preventative maintenance and will have a neutral effect on the operating budget. The No. 8 procurement will increase the Green Line fleet by 20% and the new Blue Line car procurement will increase the Blue Line fleet by 35 %. Both will result in higher operating costs for operations and maintenance.

### **Subway Operations Paint Program**

This project involves the preparing and painting of 132 Red Line cars, 120 Orange Line cars, and 169 Green Line cars. This project is intended to restore vehicle appearance and would involve any bodywork necessary. This action assists the vehicle in attaining its normal vehicle life expectancy.

### **Blue Line Overhaul**

The project consists of an overhaul of the suspension system on the Blue Line fleet. This will improve the ride quality and allow the train to perform more efficiently.

### **Blue Line Fleet Procurement**

The project involves the purchase of 94 new cars for the Blue Line. The procurement will allow for six-car train service, and increasing line capacity by 2004.

### **PCC Rebuild**

This project involves the reconstruction and overhaul of 11 PCC cars including: replacing flooring, wiring, air piping, and sheet metal and other structural components; sandblasting and painting vehicle exteriors and interiors. The rebuild will extend the life of the PCC cars.

### **Green Line No. 7 Car Overhaul—Phase II**

This project involves slewing and HVAC work on the No. 7 cars, which will ensure continued vehicle reliability and a full service life. Any remaining suspension overhaul work will also be done. The overhaul will allow the No. 7 cars to operate more effectively and provide a safer ride for passengers.

### **Green Line Low Floor Cars (No. 8) Procurement**

This project encompasses the procurement of 100 new low floor Green Line (No. 8) cars with spares. It also includes the modification of the existing No. 7 fleet to allow the No. 7 and No. 8 cars to operate together. This effort will make the Green Line accessible for disabled passengers and increase the overall size of the fleet.

### **Orange and Blue Line Converters/Overhead Motors**

This project provides an upgrade to both the Orange and Blue Line fleets. For each line, this encompasses replacing the static converters (which change DC power to AC power), and replacing overhead blowermotors for HVAC systems on these vehicles. These modifications will ensure continued vehicle reliability.

### **Orange Line No. 12 Car Rebuild—Phase II**

This project involves a door and component overhaul for the No. 12 cars, which will ensure continued vehicle reliability.

### **Orange Line Fleet Capital Reinvestment**

This project encompasses the overhaul of the suspension system and the replacement of the propulsion cam controllers for the entire Orange Line fleet. This will ensure continued vehicle reliability and allow the vehicles to reach its full service life.

### Orange Line Conversion Vehicles

This project involves the overhaul and conversion of 24 Blue Line vehicles to Orange Line vehicles in order to serve the Orange Line.

### Red Line No. 1 and No. 2 Car Modification (Retrofits)

This project involves retrofitting the Red Line No. 1 and No. 2 cars with sensitive door edges to prevent the doors from trapping passengers or articles as they close. In addition, all pass-through (emergency) doors on the No. 1 cars will have new door hangers to ensure proper operation. This will provide a safer vehicle for passengers.

### Red Line No. 1 Car Reinvestment

The purpose of this project is to do a component exchange on the Red Line No. 1 cars to ensure continued vehicle reliability and to extend vehicle service life.

### Revenue Vehicles—Subway: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Subway Paint Program	\$4.90	\$2.89	\$1.61	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
BL-Overhaul	\$7.90	\$7.34	\$0.47	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
BL-Transit Cars (94)	\$225.00	\$0.33	\$6.43	\$20.45	\$30.04	\$69.81	\$21.29	\$51.99	\$193.57	\$24.67
GL-PCC Rebuild	\$9.75	\$5.54	\$3.08	\$1.13	\$0.00	\$0.00	\$0.00	\$0.00	\$1.13	\$0.00
GL-No. 7 Car Rebuild	\$5.60	\$0.00	\$1.78	\$3.00	\$0.83	\$0.00	\$0.00	\$0.00	\$3.83	\$0.00
GL-Low Floor Cars	\$203.63	\$81.77	\$66.37	\$38.81	\$9.22	\$7.45	\$0.00	\$0.00	\$55.48	\$0.00
OL/BL Converters	\$2.60	\$2.49	\$0.11	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
OL-Car Rebuild Phase II	\$2.90	\$0.00	\$0.73	\$1.80	\$0.38	\$0.00	\$0.00	\$0.00	\$2.18	\$0.00
OL-Fleet Reinvestment	\$10.30	\$4.09	\$3.41	\$1.21	\$0.95	\$0.65	\$0.00	\$0.00	\$2.80	\$0.00
OL-Conversion Vehicles	\$10.00	\$0.00	\$0.00	\$1.00	\$1.30	\$3.00	\$2.50	\$2.20	\$10.00	\$0.00
RL-No. 1/No. 2 Car Mods	\$4.10	\$3.65	\$0.31	\$0.13	\$0.00	\$0.00	\$0.00	\$0.00	\$0.13	\$0.00
RL-No. 1 Car Reinvestment	\$5.00	\$0.00	\$0.85	\$2.65	\$1.50	\$0.00	\$0.00	\$0.00	\$4.15	\$0.00
<b>Total Program</b>	<b>\$491.67</b>	<b>\$108.10</b>	<b>\$85.14</b>	<b>\$70.18</b>	<b>\$44.20</b>	<b>\$80.90</b>	<b>\$23.79</b>	<b>\$54.19</b>	<b>\$273.26</b>	<b>\$24.67</b>

### ANTICIPATED FUTURE NEEDS

The MBTA has identified the following subway vehicle projects as future needs.

#### Red Line No. 1 Replacement Fleet

New cars will be needed to allow the retirement of the No. 1 fleet.

#### Red Line No. 2 Car Rehabilitation

A major component overhaul program will be planned in the future for the No. 2 cars.

#### Green Line Boeing Car Rehabilitation

The Boeing cars will be scheduled for a suspension overhaul.





## REVENUE VEHICLES COMMUTER RAIL

The commuter rail fleet consists of 362 passenger coaches and 80 locomotive units.

### Coaches

There are four series of coaches, including the Pullman Standard fleet, the MBB fleet, the Bombardier fleet and the Kawasaki fleet. The age of the fleet ranges between 3 and 22 years old.

- The Pullman fleet is comprised of 57 blind trailer cars, purchased in 1979 and overhauled in 1995-96
- The 67 MBB cars were purchased in 1987-88 (33 blind trailer cars, 34 control trailer cars)
- The 146 Bombardier cars include:  
40 blind trailer cars, purchase in 1987  
106 coaches, purchased in 1989-90 (53 blind trailer cars, 53 control trailer cars)
  - The 92 bi-level double-decker Kawasaki cars include:  
75 cars (50 blind trailer cars, 25 control trailer cars), purchased in 1990-91  
17 blind trailer cars, purchased in 1998  
An additional 15 coaches will be added to the fleet by 2002.

### Locomotives

The revenue locomotive fleet is comprised of 80 units that range from 3 to 23 years of age. The fleets are detailed below:

- 3 model F40PH-2 locomotives (1978); this fleet was upgraded in 1989-90
- 15 model F40PH-2 locomotives (1980); this fleet was upgraded in 1989-90
- 25 model F40PH-2C locomotives (1987-88); a midlife overhaul is in process until 2002
- 12 model F40PHM-2C locomotives (1991, 1993)
- 25 model GP4-MC locomotives (1997-98)



Locomotives and coaches are typically considered to have a useful life cycle of 25 years. Generally top-deck overhauls are scheduled for locomotives on a 6 to 6.5 year schedule. Mid-life overhauls are usually conducted at 12.5 years, and are designed to enable vehicle to reach its full service life in terms of power performance and dependability. Locomotive and coaches are typically replaced after the vehicle has met their 25-year life expectancy.

The current program devotes \$93.3 million toward the commuter rail vehicle program. This represents 13.5% of the total revenue vehicle program. The majority of the commuter rail vehicle program is devoted towards major overhaul efforts for the locomotive fleet and the procurement of 15 new bi-level coaches.

## FUNDED PROJECTS: FY01 – FY06

There are currently seven approved projects related to commuter rail vehicles. Four are major overhauls and the remaining three are procurements. The overhaul projects represent preventative maintenance and will have a neutral impact upon the Authority's operating budget. The procurement efforts will result in an increased fleet with increased operating and maintenance costs, thus resulting with a negative impact on the operating budget.

### Pullman Rebuild

The project involved the retrofit of 57 Pullman coaches, which was completed in 1996. The current program represents final payment only (retainage).

### Kawasaki Car Purchase

This project involved the purchase and retrofit of 75 double-decker Kawasaki cars. The remaining funds are being held to address contract closure.

### New Coach Procurement

The project involves the procurement of fifteen new commuter rail bi-level coach cars to support growing ridership and the addition of service along the Worcester line.

### FC627 Locomotive Procurement

This project consists of the purchase of 25 remanufactured locomotives to supplement the existing locomotive fleet. The locomotives have been placed in service and current funding is for contract warranty.

### GP40MC Top Deck Overhaul

This project involves a top deck overhaul for twenty-five GP40MC locomotives. The overhaul will recondition the fleet for passenger safety and efficiency.

### F40PH-2C Locomotive Overhaul

This effort represents a standard mid-life overhaul for twenty-five F40PH-2C locomotives purchased in 1987-1988. The overhaul will recondition the fleet for passenger safety and efficiency.

### F40PH-2M Midlife Overhaul

This effort consists of a standard mid life overhaul of twelve F40PH-2M locomotives. The overhaul will recondition the fleet for passenger safety and efficiency.

## Revenue Vehicles—Commuter Rail: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Pullman Fleet Rebuild	\$4.36	\$3.57	\$0.04	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Kawasaki Purchase	\$120.82	\$120.08	\$0.22	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Coach Proc (15)	\$37.70	\$0.00	\$21.85	\$13.98	\$1.87	\$0.00	\$0.00	\$0.00	\$15.85	\$0.00
FC627 Locomotive Proc	\$33.08	\$29.18	\$1.30	\$1.73	\$0.87	\$0.00	\$0.00	\$0.00	\$2.60	\$0.00
GP40MC Top Deck OH	\$4.30	\$0.00	\$0.00	\$0.00	\$2.10	\$2.20	\$0.00	\$0.00	\$4.30	\$0.00
F40PH-2C Locomotive OH	\$27.75	\$0.36	\$12.90	\$5.77	\$4.96	\$3.76	\$0.00	\$0.00	\$14.49	\$0.00
F40PH-2M Mid-life OH	\$19.80	\$0.00	\$0.00	\$0.00	\$0.00	\$8.70	\$11.10	\$0.00	\$19.80	\$0.00
<b>Total Program</b>	<b>\$247.81</b>	<b>\$153.18</b>	<b>\$36.30</b>	<b>\$21.47</b>	<b>\$9.81</b>	<b>\$14.66</b>	<b>\$11.10</b>	<b>\$0.00</b>	<b>\$57.04</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE NEEDS

New procurements to support planned system expansions, such as Greenbush, Fall River, and New Bedford are not included here, but are incorporated in the system expansion section of this plan. Several efforts have been identified as commuter rail fleet needs.

### **Locomotive Growth Procurement**

Five additional locomotives may be needed in order to keep up with the expected commuter rail expansion.

### **F40PH-2 Top Deck Overhaul**

This project involves a top deck overhaul for eighteen F40PH-2 locomotives to ensure continued vehicle reliability.

### **Locomotive Procurement**

The procurement of new locomotives is anticipated to support the retirement of the 18 F40PH-2 locomotive fleet.

### **F40PH-2C Top Deck Overhaul**

A top deck overhaul for 25 F40PH-2C locomotives is anticipated.

### **F40PH-2M Top Deck Overhaul**

A top deck overhaul is anticipated for 12 F40PH-2M locomotives.

### **Bombardier Coach Overhaul**

This project consists of two separate midlife overhauls. The Bombardier A overhaul (40 cars) and the Bombardier B overhaul (101 cars) are anticipated to occur in the future. The overhaul will recondition the fleet for passenger safety and efficiency.

### **MBB Coach Midlife Overhaul**

This effort involves a mid life overhaul for sixty-seven MBB coaches, as well as 5 Bombardier B control coaches. The overhaul will recondition the fleet for passenger safety and efficiency.

### **Kawasaki Truck Overhaul**

The purpose of this work is to remove, disassemble, and replace worn components of one hundred and fifty four truck assemblies of Kawasaki coaches.

### **Kawasaki Coaches Midlife Overhaul**

The project involves the overhaul of the 75 1990-1991 Kawasaki coach fleet. The 17 1998 Kawasaki coaches will require a separate overhaul at a later date.

### **Replace Pullman Fleet**

The purpose of this project is to complete the replacement of the Pullman fleet by purchasing 36 bi-level coach cars.

### **CTC1B Suppression Mod-Control Cars**

This project involves the installation of momentary suppression (MS) in fifty-one control coaches for utilization on south side operations. By installing the MS systems, it will improve the operating efficiency of the car.

### **Bi-level Procurement**

The project involves the purchase of 64 Bi-level coaches, which will allow the retirement of the MBB fleet and the Bombardier A fleet.

### **Switcher Locomotive Procurement Vehicle Needs**

The need to replace three existing switcher locomotives is anticipated.

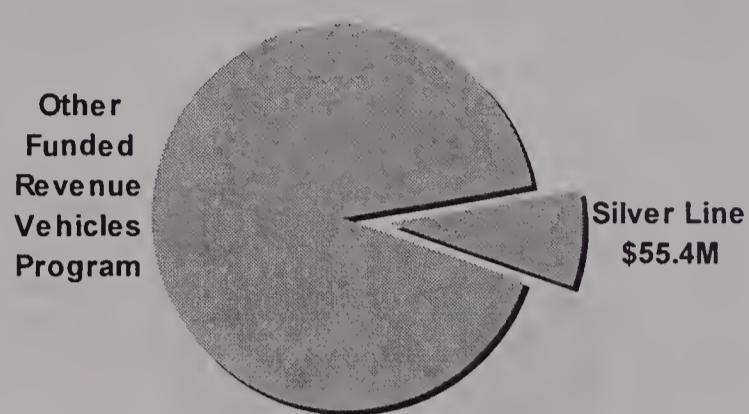




## REVENUE VEHICLES SILVER LINE

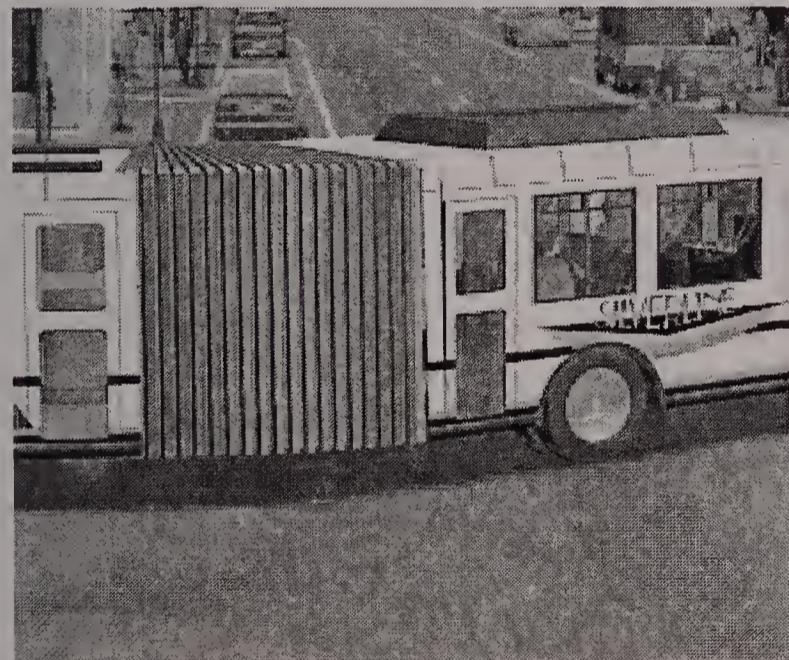
Funded Revenue Vehicles Program = \$689.1 Million

The MBTA is constructing the new Silver Line, a new Bus Rapid Transit (BRT) system with service on Washington Street and the South Boston Piers Transitway. The new Silver Line service will provide connections between residential neighborhoods and job centers in the Financial District and between South Station and the South Boston Seaport District. The service will also be coordinated with Massport to provide service to Logan Airport.



Vehicle procurements have been initiated in anticipation of Silver Line service on Washington Street (2002) and the South Boston Piers Transitway (2003). The vehicles are anticipated to have a useful life of 12 to 15 years. The introduction to the new fleets will entail additional operating funds for service and maintenance.

The plan devotes \$55.4 million towards Silver Line vehicles. This represents 8.0% of the total revenue vehicle effort.



### FUNDED PROJECTS: FY01 – FY06

There are two efforts for Silver Line revenue vehicles. One is the procurement of Washington Street Silver Line vehicles and the other is the procurement of the South Boston Transitway vehicles. Both efforts will have a negative impact on the Authority's operating budget, as operation and maintenance costs will increase.

#### Washington Street Replacement Vehicles

This procurement project consists of 17 CNG powered 60 foot articulated low floor coach buses, to provide Silver Line service between Dudley Square and downtown Boston. Each bus will be equipped with "smart" bus features, which will provide in-vehicle visual and audio next stop and destination announcements. New buses will also have the ability to provide automatic vehicle location information to Bus OCC in the future.

#### South Boston Transitway Vehicles

This procurement consists of 32 dual mode, diesel-electric, low floor coaches to provide Silver Line service between South Station and Logan Airport. These vehicles will have the ability to provide automatic vehicle location information to Bus OCC in the future.

#### Revenue Vehicles—Silver Line: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Washington St. Repl. Veh	\$13.30	\$0.00	\$2.35	\$1.37	\$9.25	\$0.33	\$0.00	\$0.00	\$10.95	\$0.00
S. Bos Transitway Veh	\$42.10	\$0.00	\$11.23	\$1.39	\$21.02	\$8.35	\$0.11	\$0.00	\$30.87	\$0.00
<b>Total Program</b>	<b>\$55.40</b>	<b>\$0.00</b>	<b>\$13.58</b>	<b>\$2.76</b>	<b>\$30.27</b>	<b>\$8.68</b>	<b>\$0.11</b>	<b>\$0.00</b>	<b>\$41.82</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE NEEDS

*Currently, there are no anticipated future needs for Silver Line revenue vehicles. Once it is completed in 2010, preventative maintenance efforts will be programmed to maintain Silver Line.*



## REVENUE VEHICLES BUS

This program includes vehicles to support the MBTA's bus, trackless trolley and demand-responsive (RIDE) services. The MBTA's bus and trackless trolley system is comprised of 159 routes. The RIDE, a paratransit service for individuals with mental and physical disabilities, provides accessible service in 62 cities and towns.

### Bus fleet

The bus fleet consists of 978 active diesel buses (of six major classifications), 4 "prototype" alternative fueled buses and 41 trackless trolley vehicles. The 40' diesel coaches have a useful life of 15 years, and the trackless trolleys have a useful life of 20 years. Major procurement efforts over the next few years will transition these vehicles to lower emissions technologies. In addition, 426 RIDE vehicles are maintained under the bus program.

#### • 1999 Future Bus Prototype

To determine the most appropriate technology for future bus purchases, the Authority has undertaken a future bus pilot program. In the summer of 1999, the MBTA accepted delivery of two compressed, natural gas (CNG) and two diesel electric hybrid buses. Both bus types are 40 feet in length. The prototype program will enable a decision on which bus propulsion technology will be made.

#### • 1995 Nova RTS

The newest and most recent acquisition of the MBTA, the 149 Nova coaches are 5 years old and are equipped with wheelchair lifts and air conditioning.

#### • 1994 TMC RTS

This series is comprised of 249 coaches that are 6 years old, which are equipped with both wheelchair lifts and air conditioning.

#### • 1989 TMC RTS

This second series is comprised of 200 coaches with a fleet age of 11 years. Within this series, 30 coaches are 35 feet long, the only non-40 foot length buses in the bus fleet. This fleet is equipped with wheelchair lifts and air conditioning, and were fully overhauled in 1996.

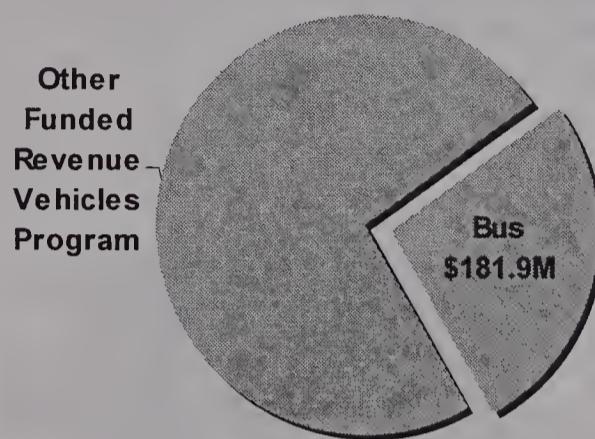
#### • 1985-1987 GMC RTS

This fleet is made up of 380 coaches with the fleet age ranging between 13 and 15 years. These buses were delivered in three distinct phases: 200 in 1985, 90 in 1986, and 90 in 1987. These 40-foot coaches had full mid-life overhauls in 1994 and 1996.

#### • Trackless Trolleys

The trackless trolley fleet includes 41 electric trolley buses (1976). The trackless trolleys have attained their service life expectancy and are in the process of being replaced. Service life for the new trackless trolleys remains to be confirmed; however, it is expected to approximate to 20 years.

**Funded Revenue Vehicles Program = \$689.1 Million**



- The “RIDE”

The RIDE fleet consists of 426 cars and vans that have a normal life of 5 years. The MBTA owns 265 vehicles (154 vans, 111 sedans) and the remaining 161 vehicles are supplied by four different contractors. The Authority is moving toward a contracting program for these vehicles. The current fleet is not being replaced as vehicles attain their service life.

The MBTA's maintenance strategy for the bus program is ongoing with continuous, frequent preventive maintenance inspections along with complete repairs of all defects using new parts. Part replacement is on a programmed schedule to prevent complete component failure. Power train overhauls are completed every 250-300 thousand miles. This effort maximizes vehicle and component utilization by employing advanced preventative maintenance practices. With this program in place, there are no major mid-life rebuild/overhaul projects planned for the future.



The current plan programs \$181.9 million toward bus vehicles. This total represents 26.4% of total expenditures in the revenue vehicle program. The majority of the bus program spending is for the procurement of over 380 buses as a replacement fleet for the 1984-87 bus series. The Authority is also in the process of procuring a new replacement fleet of trackless trolleys.

#### **FUNDED PROJECTS: FY01 - FY06**

There are six approved projects. Four involve the procurement of replacement vehicles, which will have a positive impact on the operating budget. Two projects involve the evaluation of future vehicle technologies, which have a neutral impact on the operating budget.

##### **Bus Technology Initiatives**

The project entails the purchase and evaluation of 4 prototype alternative fuel buses. The Authority has purchased two low-floor diesel electric hybrid buses, and two low-floor CNG buses. The buses are being operated in revenue service and evaluated to help determine a recommended technology for future fleet replacement. CNG and dual mode buses have a 12-year service life expectancy.

##### **Alternative Fuels Study**

This project responds to the 1996 Bond Bill which directed that \$100,000 be expended to evaluate the feasibility of developing a non-polluting transit and the benefits of alternative fuel technologies.

##### **Induction Bus**

This proposal would develop 4 prototype buses using a new technology, known as the Roadway Powered Electric Transit Bus Demonstration Project. Two buses would be used by the MBTA and two by Massport (both agencies are contributing local matching funds towards a federal grant for this effort). This effort will aid the Authority in determining the best bus technology for the future.

##### **Procurement of Rapid Transit Buses**

This effort will allow the Authority to offer higher quality service on high ridership bus routes, using lower emission vehicles.

##### **Bus Fleet Replacement (1984-87 Buses)**

This effort involves the replacement of 190 RTS buses purchased between 1984 and 1986 and 90 1987 RTS buses. The technology of these vehicles will be determined by the Bus Technology project described on the previous page. To replace a portion of the retiring RTS buses (purchased between 1984 and 1987), the Authority is planning to procure 27 60' articulated CNG rapid transit buses. This project will have a negative impact on the Authority's operating budget due to fuel costs.

### Trackless Trolleys

The project involves the procurement of 28 trackless trolleys to replace the existing fleet. The new fleet will incorporate new technology, along with low-floor design to accommodate all riders and smart-bus features.

#### Revenue Vehicles—Bus: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Bus Tech. Initiatives	\$3.90	\$2.18	\$1.72	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Alternative Fuels Study	\$0.10	\$0.00	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Induction Bus	\$3.70	\$0.00	\$1.96	\$1.70	\$0.04	\$0.00	\$0.00	\$0.00	\$1.74	\$0.00
Bus Rapid Transit Proc	\$19.70	\$0.00	\$0.00	\$0.00	\$3.93	\$15.78	\$0.00	\$0.00	\$19.70	\$0.00
84-87 Bus Fleet Repl.	\$126.00	\$0.00	\$0.23	\$3.90	\$69.67	\$50.78	\$1.43	\$0.00	\$125.77	\$0.00
Trackless Trolleys	\$30.70	\$0.00	\$7.45	\$0.04	\$6.03	\$14.34	\$2.39	\$0.44	\$23.24	\$0.00
<b>Total Program</b>	<b>\$184.10</b>	<b>\$2.18</b>	<b>\$11.45</b>	<b>\$5.64</b>	<b>\$79.66</b>	<b>\$80.89</b>	<b>\$3.82</b>	<b>\$0.44</b>	<b>\$170.46</b>	<b>\$0.00</b>

### ANTICIPATED FUTURE NEEDS

The MBTA will work towards programming bus vehicle acquisition so that a smaller number will be delivered at regular intervals (50 to 100 coaches every two years). With an average fleet age of nine years and 20% of the existing fleet within 18 months of eligible retirement, near term acquisition forecasts will exceed this goal but should level off in later years. This strategy will reduce mechanical dependency on a single class of vehicles. The following projects have been identified as future efforts for bus revenue vehicles.

#### 1989 RTS Fleet Replacement

The procurement of new buses is anticipated after the conclusion of this six-year program for the retirement of 200 40' 1989 RTS buses.

#### 1994 RTS Fleet Replacement

The procurement of new buses is anticipated after the conclusion of this six-year program for the retirement of 249 40' 1994 RTS buses.

#### 1995 Nova Fleet Replacement

The procurement of new buses is anticipated after the conclusion of this six-year program for the retirement of 149 40' 1995 Nova RTS buses.





## PROGRAM OVERVIEW

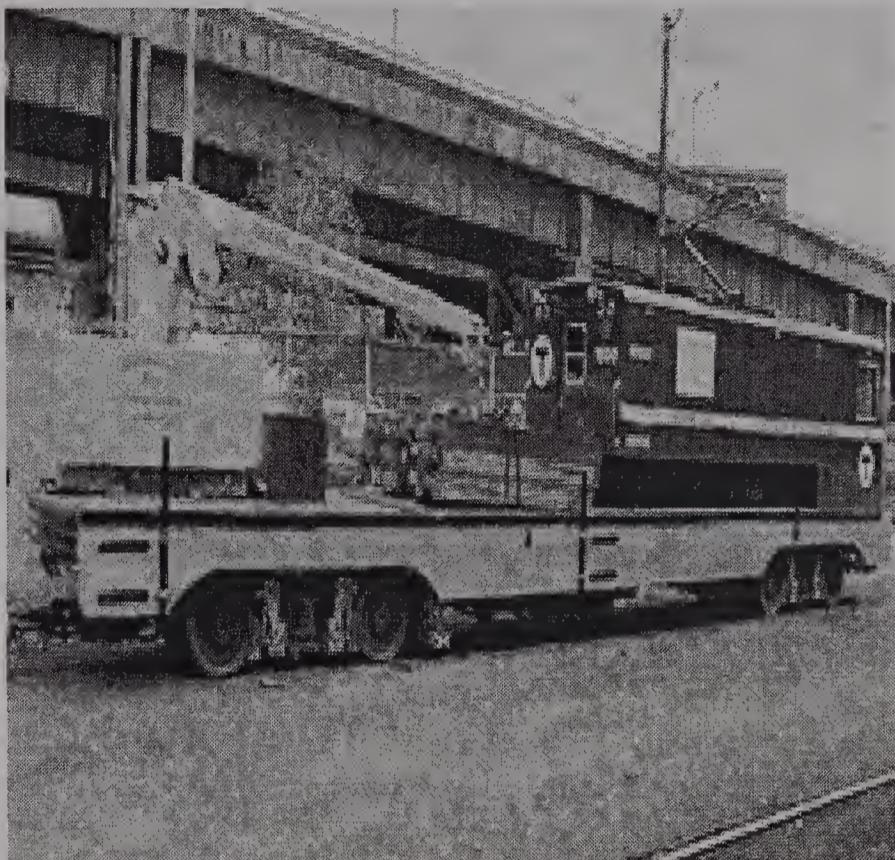
Non-revenue equipment includes both non-revenue vehicles and work equipment.

Systemwide non-revenue vehicles support the entire range of Authority operations. Included in this category are a wide array of rubber tired vehicles that are used for maintenance, safety, field supervision and revenue collection. The MBTA owns and maintains 858 non-revenue vehicles, including 479 vehicles to support subway and bus operations, 115 police vehicles, 219 vehicles to support commuter rail and an additional 45 specialty vehicles such as fork trucks, sweepers, trailers, generator or pumps. Non-revenue vehicles have a service life of approximately 10 years.

Non-revenue vehicles used to maintain commuter rail rights-of-way include rail-mounted (or on-track machines) such as track geometry cars, flat cars, cranes, tampers, ballast regulators, ballast cars, tie handlers, and brush cutters.

The Authority maintains non-revenue equipment. There are brush cutters, loaders, pumps, tractors, air compressors, and various other equipment. Included in the maintenance of way category are crane, bucket, cable, platform and snow fighting trucks. Rubber-tire construction equipment includes front-end loaders, backhoes, and cranes. Non-revenue equipment has a service life of 10 years.

Currently, there are no funds devoted towards the non-revenue equipment program.







## NON REVENUE EQUIPMENT SUBWAY

Non-revenue vehicles used to maintain the MBTA's subway and light rail rights-of-way include rail-mounted (or on-track) machines such as track geometry cars, dump cars, wire cars, flat cars, cranes, tampers, box cars, ballast cars, and clearance cars. They have various service lives, ranging from 4 years to 15 years.

- **Rapid Transit Work Cars**

There are 17 assorted rapid transit work cars: box cars, clearance cars, cranes, flat cars, snowplow, and wire cars. These cars range in useful life from 20 to 40 years.

- **Snow Plow Cars**

The Authority has 7 snowplows ranging from 2 to 12 years of age. They are located at the Reservoir, Riverside, and Mattapan yards. Snowplow cars have a useful life of 30 years.

Other specialty vehicles include the GLP (generator, lift, and pump) car, an Emergency Response vehicle, and the Maintenance of Way (MOW) car. These items generally have 20-year service lives.

## FUNDED PROJECTS: FY01 - FY06

*There are no capital projects for subway non-revenue equipment program.*

## ANTICIPATED FUTURE NEEDS

The ability of the Authority to perform maintenance, respond to service problems and react to safety issues is critical and the condition of the fleet that supports those activities is a major consideration. The current fleet is comprised of vehicles, which in some cases have attained their service life.

### **Subway Non-Revenue Vehicle Needs**

Four snowplows are anticipated for the Green Line, among other subway non-revenue vehicle needs.

### **Crane Replacement**

The project involves the procurement and installation of 12 new overhead cranes in the main subway repair facility. The existing 60-year old cranes require extensive maintenance resulting in increasing downtime and costly repairs.





## NON REVENUE EQUIPMENT COMMUTER RAIL

Non-revenue vehicles which are used to maintain commuter rail rights-of-way includes rail-mounted (or on-track machines) such as track geometry cars, flat cars, cranes, tampers, ballast regulators, ballast cars, tie handlers, and brush cutters. They have various service lives, ranging from 4 years to 15 years.

### FUNDED PROJECTS: FY01 - FY06

*There are no capital projects for the commuter rail non-revenue equipment program.*

### ANTICIPATED FUTURE NEEDS

The ability of the Authority to perform maintenance, respond to service problems and react to safety issues is critical and the condition of the fleet that supports those activities is a major consideration. The current fleet is comprised of vehicles, which in some cases have attained their useful life service.

#### Commuter Rail Non-Revenue Vehicle Needs

Anticipated is the replacement of six aging K cars and light trucks used by MBTA staff in the inspection of Amtrak maintenance efforts. The replacement of approximately 45 maintenance of way (MOW) work vehicles will also need to be scheduled.

#### Replacement of M/W Work Equipment

Replacement of Maintenance of Way work equipment that has reached the end of or exceeded its useful life. This equipment includes tie replacement, snow removal, brush cutting, track geometry inspection, excavating equipment and other maintenance support equipment.





## NON REVENUE EQUIPMENT SYSTEMWIDE

Systemwide non-revenue equipment includes equipment used to maintain systemwide property and assets throughout the Authority.

### FUNDED PROJECTS: FY01 – FY06

*There are no capital projects for the systemwide non-revenue equipment program.*

### ANTICIPATED FUTURE NEEDS

The ability of the Authority to perform maintenance, respond to service problems and react to safety issues is critical and the condition of the fleet that supports those activities is a major consideration. If this equipment is not functioning then the track and right-of-way will also be adversely affected. Systematic replacement of older equipment along with a regular maintenance program is required to keep the fleet in a state of good repair. The projects listed below have been identified as anticipated future needs for systemwide non-revenue equipment.

#### Systemwide Non-Revenue Vehicle Needs

A fleet plan will be developed to prioritize the remaining need to replace aging non-revenue vehicles.

#### Maintenance of Way Work Equipment Purchase

This effort would replace work equipment, which has reached the end of or exceeded its useful life. This equipment includes tie replacement, snow removal, brush cutting, track geometry inspection, excavating equipment and other maintenance support.

#### Signals and Communications Signal Crew Equipment

The project involves the procurement of non-revenue equipment to replace aging vehicles within the signal division.



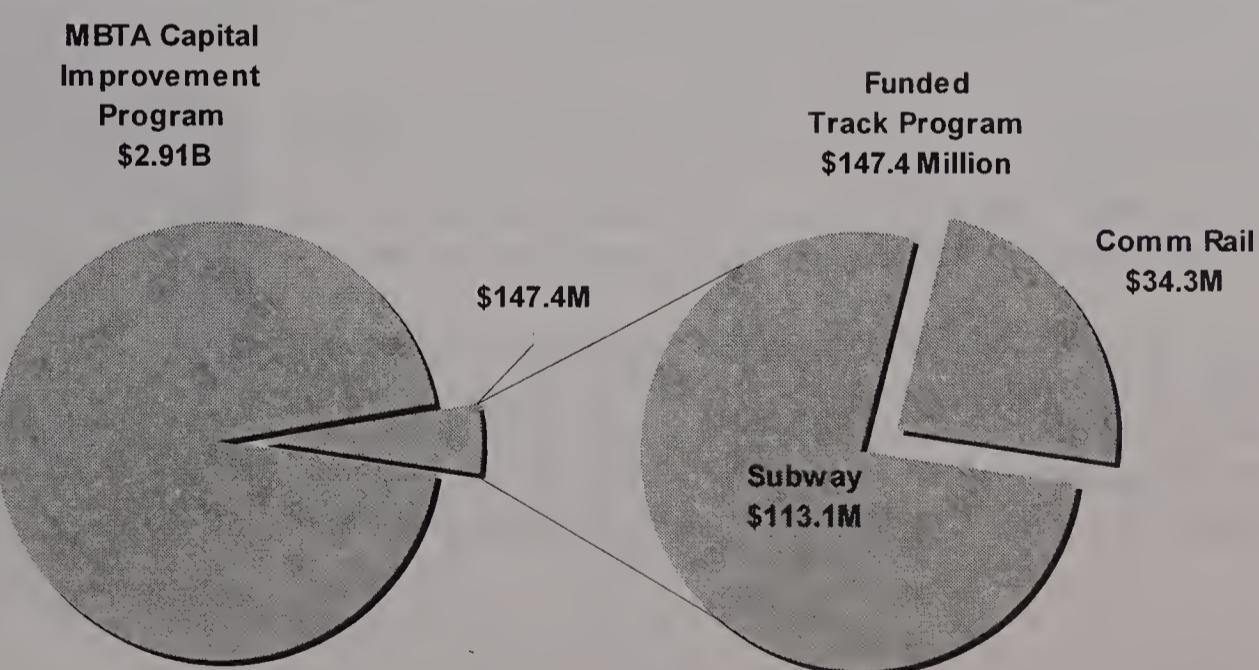
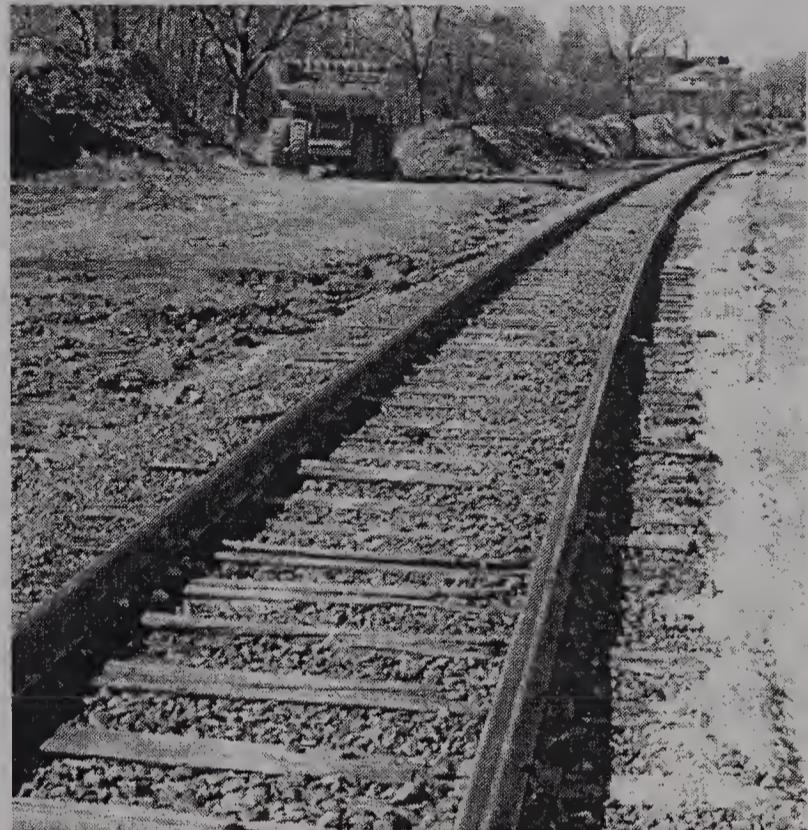


## PROGRAM OVERVIEW

The MBTA currently operates light and heavy rail transit over 185 miles of track. The commuter rail system is operated over 600 miles of track. On each rail line, replacement efforts are programmed for different segments based upon geographical location or type of track construction.

The right-of-way generally consists of track, ballast, concrete or timber ties. Track has a useful life of 25 years. The grade crossings in the system have special maintenance and replacement needs, and are typically replaced as part of a special program.

The current program devotes \$147.4 million towards track/r.o.w. The five-year track/r.o.w program represents 5.1% of the total capital investment program. Most of this funding is devoted toward the subway track/r.o.w program. Major projects include the replacement of concrete ties on the Red Line and a three-year program to replace grade crossings on the Green Line.







## TRACK/R.O.W. SUBWAY

Funded Track Program = \$147.4 Million

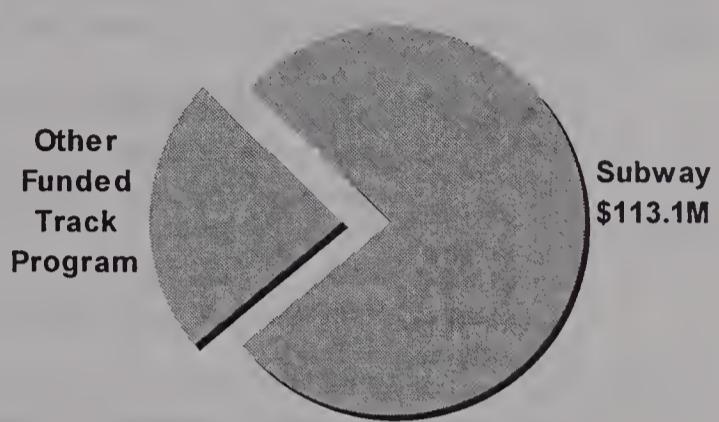
The MBTA subway system operates on 185 miles of track, including 125 miles of revenue track and an additional 60 miles of non-revenue track within yards and other service areas.

- The Red Line operates over 45 miles of revenue track. The type of track construction consists of timber tie track, concrete dual block tie track, direct fixation, and concrete floating slab track. The entire line is powered by third rail.
- The Orange Line operates over 22 miles of revenue track. The type of track construction consists of timber tie track, direct fixation, and concrete floating slab track. The entire line is powered by third rail.
- The Blue Line operates over 12 miles of revenue track. The main type of construction on the line is timber tie track; however, sections of the track are monoblock concrete tie track. The tracks are powered by both third rail and overhead catenary lines.
- The Green Line (Light Rail) has a total of 46 revenue track miles. Although the track type varies throughout the Green Line, the majority of the line is wood tie and ballast units and some monoblock concrete tie track as well. The running rail on the line consists of both "T" rail and girder guardrail. The entire line is powered by overhead catenary.



Subway grade crossings have a useful life ranging between 12 to 15 years. There are 64 grade crossings along the Green Line and other crossings within MBTA yards. The subway fleets operate over 1 million feet of mainline ballasted track and over 400,000 feet of yard ballasted track. The MBTA has approximately 560 mainline turnouts (including equipment), that have useful lives ranging from 4 to 25 years. There are 675 total yard turnouts and equipment, which have useful lives ranging from 8 to 25 years.

The current program devotes \$113.1 million toward subway track/r.o.w. This total represents 76.8% of track/r.o.w expenditures. Immediate major efforts include a grade crossing reconstruction program on the Green Line, reconstruction of a portion of the E-line and replacement of ties on the Red Line. Other efforts are programmed throughout the rapid transit system.



## FUNDED PROJECTS: FY01 - FY06

There are seven projects occurring in the subway track/r.o.w. program as part of the current plan including major investments on the Orange, Red, Blue, and Green track systems, grade crossing reconstruction and other systemwide efforts. Two projects along the Green Line (track reconstruction and the grade crossing reconstruction) will have positive impacts on the operating budget. The remaining projects will have a neutral impact on the operating budget. Failure to complete these projects as proposed will have a negative impact on the Authority's operating budget.

### Blue Line Track Modifications

This project involves the replacement of 1,500 feet of track and associated crossties and ballast. The effort will replace track sections that are at the end of their useful lives.

### Green Line Track Modifications

This project involves the replacement of 4,000 defective wood ties on the Green Line for track sections that are at the end of their useful lives.

### Green Line Track Reconstruction (E Line: Huntington to Heath)

This effort will reconstruct 2,000 feet of track on the E Branch of the Green Line, along South Huntington Avenue between Huntington Ave. and the Heath Street terminus. The project will increase reliability and trip speeds in that area in addition to making Heath St. station ADA accessible.

### Green Line Grade Crossing Reconstruction (B and C Lines)

The project consists of the reconstruction of 23 of 64 vehicular crossings on the Green Line over a three-year period. The scope of work includes design, site preparation, track and roadway construction. The project will enable the Authority to lift current operating restrictions and decrease trip times.

### Orange Line Track Upgrade

The project involves the replacement of 2,000 defective wood crossties, and rail renewal with the continuous welded rail. The effort will replace track sections that are at the end of their useful lives.

### SMI Efforts-Track Modifications

This project involves miscellaneous subway track and right of way upgrades/renewals. The project includes rail grinding, brush cutting, railroad crosstie renewal, and addressing maintenance concerns.

### Systemwide Subway Track SMI Efforts

This project represents funding that has been set aside to address current and future subway track infrastructure needs.

### Track/R.O.W.—Subway: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
BL-Track Mod	\$2.61	\$2.35	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
GL-Track Mod	\$2.08	\$1.65	\$0.43	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
GL-E Line Reconstruction	\$4.11	\$0.03	\$4.08	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
GL-Grade Crossing	\$6.98	\$2.69	\$4.29	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
OL-Track Mod	\$3.85	\$3.47	\$0.38	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
SMI Effort-Mod	\$4.72	\$3.14	\$0.95	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Subway Track SMI Efforts	\$207.80	\$0.00	\$15.65	\$16.20	\$16.78	\$17.40	\$18.04	\$18.71	\$87.13	\$105.02
<b>Total Program</b>	<b>\$232.15</b>	<b>\$13.34</b>	<b>\$26.02</b>	<b>\$16.20</b>	<b>\$16.78</b>	<b>\$17.40</b>	<b>\$18.04</b>	<b>\$18.71</b>	<b>\$87.13</b>	<b>\$105.02</b>

## **ANTICIPATED FUTURE NEEDS**

There are maintenance issues that apply to several or all of the rapid transit and light rail lines. Performing periodic renewal and replacement efforts in a timely manner reduces daily operating costs, reduces life cycle costs and increases reliability and safety. A continual rail changing and tie renewal program is needed to keep the track structure in a state of good repair. The following projects have been identified as future needs.

### **Track Design Standards**

This project would develop track design standards in the form of a book of standard plans and specifications.

### **Green Line Grade Crossing Reconstruction**

The goal is to replace the remaining 41 Green Line grade crossings and rebuild approximately one-half (22) every five years.

### **Blue Line Rail Changing**

A rail-changing program is anticipated in order to replace worn rail and existing bolted rail with new No. 115 CWR from Bowdoin to Maverick; in addition the existing No. 85 rail from Maverick to Airport will be replaced with new No. 115 rail and vertical guardrail.

### **Red Line Columbia Junction Interlocking**

The project involves the replacement of crossties and the relocation of some of the switches for upgrading.

### **Green Line Tie Renewal Program**

Tie renewal programs to replace defective wood ties with new wood ties is anticipated along the following branches: Beacon Street, Commonwealth Avenue, Brookline Hills/Beaconsfield, Highland and Reservoir Yard, including all of the D Line.

### **Blue Line Tie Renewal Airport-Wonderland**

A wood tie replacement program for the 21,000 ties is anticipated from Airport to Wonderland.

### **Orange Line Ties Replacement**

A tie renewal program is anticipated from Haymarket to Oak Grove, this would replace 50,000 wood ties with new wood ties.

### **Orange Line Community College/Oak Grove Tie Replacement**

A tie replacement program is expected for Community College to Oak Grove station.

### **Green Line Track Rebuild**

A program to rebuild the track structure through and for 50 feet on each side of all stations and grade crossings is foreseen.

### **Red Line Surface Tamper/Mainline Thermite Weld/CWR**

The project involves the surfacing and tamping of the track, in addition to thermite welding of the rail to improve the quality of the ride.

### **Orange Line Third Rail Upgrade**

This program will replace the third rail concrete support pedestals with 4,000 treated wood blocks. A program to replace approximately 2,000 feet of third rail in the station areas is also anticipated.

### **Green Line Track Rehabilitation**

Track replacement programs are anticipated for areas between Brookline Village and Reservoir, and along the C-Line. Track replacement at all platforms is included.

**Blue Line Special Trackwork**

This is a special trackwork renewal program to replace all turnouts.

**Red Line Fully Guarded Switches**

The project involves the deactivation of the switches that do not meet track standards.

**Blue Line Orient Heights Track Rebuild**

The project involves the rebuilding of the track in the Orient Heights yard.

**Orange Line Special Track Work: Rebuild Wellington**

Programs to rebuild the track structures and replace yard turnouts in Wellington Yard are anticipated.

**Red Line Floating Slab Alignment Repair**

This project would rebuild the floating slab track from Harvard to Alewife to replace sectors of track that age more quickly than anticipated.

**Red Line Ashmont Line Rail Program**

A program to replace the old No. 150 third rail with new No. 85 third is anticipated for the Ashmont and Braintree line.

**Red Line Clayton Street Curve Reconstruction**

The project involves the reconstruction of this section of track so speed restrictions may be lifted.

**Subway De-watering Pump Replacement**

This project involves the replacement of existing subway right-of-way and de-watering pumps at South Cove, Columbia Junction, and Medford Underpass.

**Systemwide Track Charts**

The purpose of this effort would be to create track charts for the remaining lines so that we have systemwide track charts.



## TRACK/R.O.W. COMMUTER RAIL

Funded Track Program = \$147.4 Million

Commuter rail right-of-way consists of rail, wooden ties, railroad crossties, grade crossings, and fencing.

The commuter rail system is divided into eleven major operating lines.

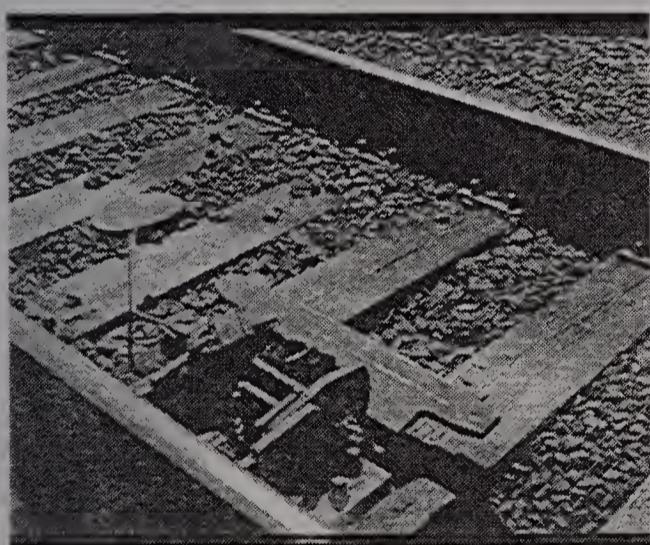
### North Side—North Station Terminal

- The Fitchburg line operates over 90 miles of track
- The Lowell line operates over 50 miles of track
- The Haverhill line operates over 55 miles of track
- The Newburyport/Rockport line operates over 92 miles of track



### South Side—South Station Terminal

- The Worcester line operates over 89 miles of track
- The Needham line operates over 13 miles of track
- The Franklin line operates over 34 miles of track
- The Attleboro/Stoughton line operates over 116 miles of track
- The Fairmont line operates over 19 miles of track
- The Middleborough/Lakeville line operates over approximately 47 miles of track
- The Plymouth/Kingston line operates over approximately 32 miles of track



Rail in the commuter rail system can be expected to last approximately 40 years, although curve rail has a shorter life span. The system has over 1,300 miles of rail. In order to operate efficiently, about 26 miles of rail are renewed annually.

There are approximately 1.5 million timber crossties and switch timber supporting the rail in the commuter rail system. Railroad crossties are renewed on a cyclical schedule that ensures failed ties do not impose speed restrictions which result in train delays. Railroad cross ties usually have a life span of 25 to 30 years depending on a variety of mechanical and biological factors. They also require a renewal of approximately 48,000 cross ties and 5,000 switch timbers annually.

Grade crossings are the most prominent fixtures of the commuter rail system. The Authority has 257 grade crossings on the commuter rail system, requiring a replacement program averaging 21 crossings per year. They provide comfort and safety for both commuter rail passengers and highway motorists. Grade crossings have a life expectancy of 12 years. The automatic protection equipment is maintained under the signal program.

The current program devotes \$34.3 million toward commuter rail track/r.o.w. This total represents 23.2% of track/r.o.w expenditures in the capital investment program. It all will be expended on systemwide commuter rail track work.

## FUNDED PROJECTS: FY01 - FY06

Currently, there is one project for commuter rail track/r.o.w. It will have a neutral impact on the Authority's operating budget.

### Systemwide Commuter Rail Track SMI Efforts

This project represents funding that has been set aside to address commuter rail track infrastructure needs.

#### Track/R.O.W.—Commuter Rail: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
CR Track SMI Efforts	\$69.26	\$0.00	\$5.22	\$5.40	\$5.59	\$5.80	\$6.01	\$6.24	\$29.04	\$35.01
<b>Total Program</b>	<b>\$69.26</b>	<b>\$0.00</b>	<b>\$5.22</b>	<b>\$5.40</b>	<b>\$5.59</b>	<b>\$5.80</b>	<b>\$6.01</b>	<b>\$6.24</b>	<b>\$29.04</b>	<b>\$35.01</b>

## ANTICIPATED FUTURE NEEDS

The tracks for the 11 commuter rail lines throughout the system are in varying conditions. Four lines are in less than fair to acceptable condition, four are in good condition, and three are new and in excellent condition. Systemwide, there are maintenance issues which apply to several or all of the rail lines. Performing periodic renewal and replacement programs in a timely manner reduces daily operating costs, reduces life cycle costs and increases reliability and safety. The MBTA has identified the following projects as future needs for commuter rail track.

### Lowell Junction/Frey Double Track

This project would double track the West Route between Lowell Junction and Frey to reduce delays and improve the flexibility of scheduling both passenger and freight trains.

### Winchester-Mishawum Rail Replacement

The project is the replacement of 5.6 miles of No. 112 and No. 115 rail on track between Winchester and Mishawum.

### Fitchburg Main Line Rail Replacement

This project involves the replacement of 18.4 miles of 112 pound, non-control-cooled rail on the Fitchburg Main Line between Willows and Fitchburg.

### Ayers and Willows Rail Replacement

This project encompasses the replacement of 3.2 miles of 115 pound jointed rail between Willows and Ayers.

### Rail Inventory Purchase

The project is the purchase of 10,000 feet of head hardened 132RE rail to replenish inventory and replace worn out railing.

### Elimination of Bleachery Interlocking

This project encompasses the relocation of Guilford's train operations from Lowell to Lawrence; the removal of crossovers between MBTA's New Hampshire Main Line operations and Guilford's Lowell Branch; and the relocation of one crossover and removal of four crossovers.

### South Acton Station Double Track

This project would extend the double track portion of the Fitchburg Main line west through the station at South Acton. The extension of the double track would allow trains turning at South Acton to be held clear of passing trains, and subsequently reduce delays.

### **Reading Station Double Track**

This project would extend the West Route double track north through Reading Station. The extension would allow trains turning at Reading to be held clear of passing trains, thus reducing delays and freight conflicts.

### **Beverly Drawbridge: Upgrade Mechanical Devices**

This project involves the following: removal of all outdated and worn gears and replacing them with new parts; redesigning the push/pull rod system and wedge mechanisms for greater reliability and durability; and updating bearings and ancillary equipment.

### **Three Stations (Salem, Manchester, Gloucester) Upgrade Approach**

This project involves the installation of approach tie pads at Conley expansion joints at Saugus, Manchester, and Gloucester drawbridges.

### **Commuter Rail Fencing**

The installation and maintenance of right-of-way is important to the safe operation of trains, prevention of trespassing, protection of railroad property, and prevention of illegal dumping of trash and contaminated materials on railroad property.

### **Montvale Yard Rehabilitation**

This project will provide for the rehabilitation and upgrade of the entire Montvale Yard on the New Hampshire main line.

### **Future Systemwide Tie Replacement Program**

The project involves the systemwide replacement of defective ties.

### **Systemwide Tie Renewal Program**

Tie renewal programs will enable reliable and continual commuter rail usage.

### **Systemwide Grade Crossing Renewal**

This project will provide funds for the renewal of grade crossings on the commuter rail system.





## PROGRAM OVERVIEW

Train control is an integral part of an operating transit system. Signals are responsible for collision avoidance, route integrity, speed control and enforcement, broken rail protection, and all other safety aspects. The MBTA utilizes Automatic Train Control (ATC) and Absolute Block Signaling (ABS). ATC includes Automatic Train Protection (ATP) and Automatic Train Operation (ATO) subsystems. The ATP consists of wayside equipment in a traditional signal control system. The ATO system is a carborne package, which automates many train crew functions, in accordance with commands received from wayside equipment. The ABS system uses only the wayside system with no automated vehicle controls.

The baseline for signal systems is the use of vital relays that operate in a "fail-safe" mode. This equipment is housed in Central Instrument Rooms/Houses (CIR/H) and wayside cases or bungalows. These control systems house relays, fuses, transformers, rectifiers and resistors, as well as switches, signals, track circuits, heaters, train stops, and train approach lights.

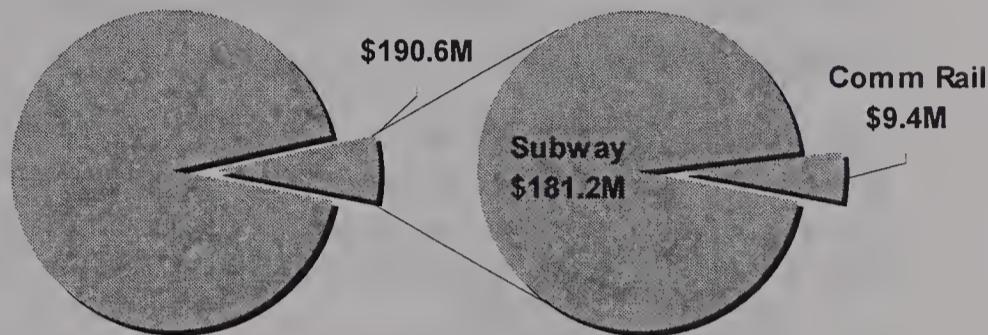
### Signal Systems Components (Shared by Commuter Rail and Subway)

#### Switches, Crossovers, and Switch Heaters

Switches and crossovers are incorporated in the track system to reroute trains. Both electric and hand throw switches are used. Switch heaters are used to keep switches functioning during the winter months. Switches, crossovers, and switch heaters typically have a 5-year useful life.

MBTA Capital  
Improvement  
Program  
\$2.91B

Funded  
Signals Program  
\$190.6 Million



#### Signals/Wayside Lights

Wayside lights display a combination of signal aspects to communicate the status of the next track segment to the train operator. They typically have a useful life of 2 years.

#### Track Circuits

The track circuit is the most vital part of the signal system and consists of a power source, a transformer or transmitter circuit and a receiver or relay end. AC track circuits are used on the Blue and Green lines as well as on all interlocking areas. Audio frequency track circuits, made up of a transmitter and receiver end, are used on the Red and Orange Lines. They have a 20-year useful life.

#### Grade Crossing Signals

Grade crossing signals are used on the commuter rail network to warn automobile and pedestrian traffic of oncoming trains. They have a useful life of 20 years.

#### Train Stops and Train Stop Heaters

Train stops are utilized on the rapid transit lines to ensure compliance with restrictive indications and have a useful life of 20 years. Heaters keep the train stops functioning in the winter. They usually have a useful life of 5 years.

## Signal System Components (Subway Only)

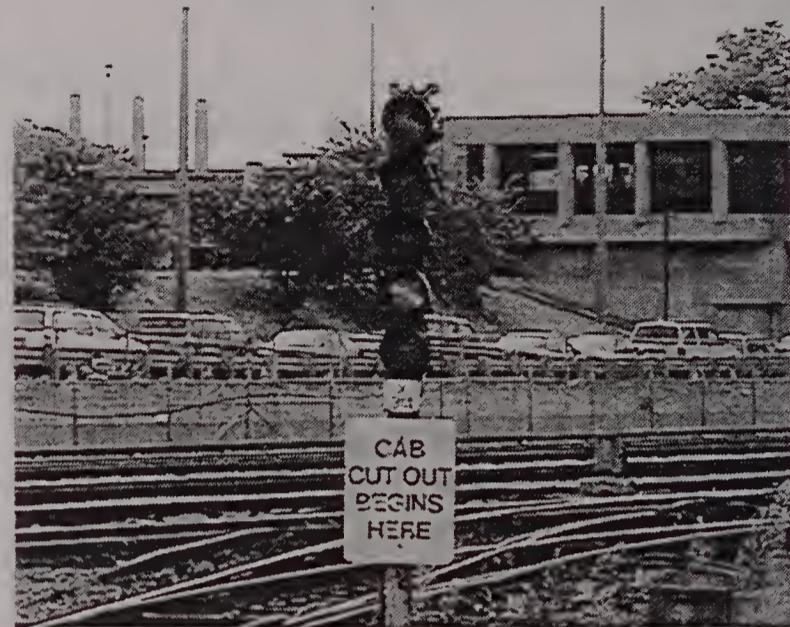
### **Third Rail Heaters**

Third rail heaters are used to keep the rails from icing over during the winter months. The Authority utilizes over 540,000 feet of third rail heaters. All third rail heaters have a useful life of 5 years. In addition, there are 43,990 third rail heater insulators, which have a typically have a useful life of 5 years.

### **Train Approach Lights (TAK)**

Train Approach Lights (TAK) are utilized on the rapid transit as a safety indicator for operations people on the right-of-way. They have a useful life of 20 years.

The current program devotes \$190.6 million toward signals. The six-year signal program represents 6.6% of the total capital investment program. Two major efforts include the rehabilitation of the Green Line signal system to repair damage done during the October 1996 flood, and an upcoming effort to replace the north segment of the Orange Line signal system.



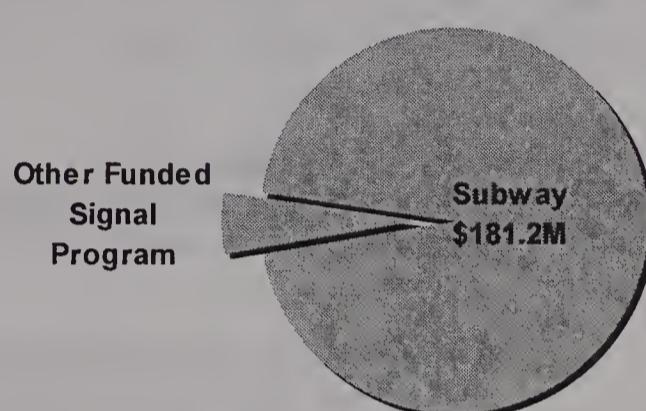


## SIGNALS SUBWAY

The Authority's subway signal program consists of two types of control systems (ATC and ABS) varying by line. The Red and Orange Lines use an Automatic Train Control (ATC) system while the Blue and Green Lines utilize an Absolute Block Signal (ABS) type system. Each line consists of mainline and yard segments.

- The Red Line signal system consists of several yard and mainline segments. It is an ATC system, which means it uses vehicle systems and wayside controls to regulate train movement. There are a total of 135 switches; 210 signals; 355 track circuits; 1,632 third rail heaters; 68 switch heaters; 2 train stops heaters; 2 train stops; 12 train approach lights; and 16 instrument houses. Currently, the Authority is in the process of replacing generation one-track in Central Square, Downtown Crossing, JFK/UMASS, Ashmont, North Quincy, Quincy Center and South Shore. The significant number of third rail heaters is due to a large segment of the line that is above ground and exposed to the elements.
- The Orange Line utilizes a combination of ATC and wayside block signal systems. It has a total of 107 switches; 199 signals; 245 track circuits; 457 third rail heaters; 101 switch heaters; 34 train stop heaters; 17 train stops; 48 train approach lights; and 12 instrument houses. The signal system, from Chinatown to Oak Grove, is about 25 years of age and is currently programmed for replacement.
- The Blue Line has a total of 86 switches; 154 signals; 181 track circuits; 12 third rail heaters; 43 switch heaters; 145 trip stop trips each with two heaters; 145 train stops; 74 train approach lights and 6 instrument houses. At the completion of the Airport and Aquarium stations, there will be 2 additional instrument houses. The Blue Line is equipped with ABS with train stops, and it does not utilize on-board subsystems for train movement.

**Funded Signal Program = \$190.6 Million**



- The Green Line signal system is the oldest signal system in the United States, portions of which exceed the industry standards for useful life. It is equipped with the ABS signal system, but without train stops. It has a total of 91 switches, 497 signals, 497 track circuits and 40 switch heaters. Portions have been upgraded following the flood of 1996 including Brookline Village to Hynes Auditorium. Haymarket to North Station is being upgraded as part of the North Station reconstruction.

The OCC equipment, bungalows/central instrument locations, wayside systems, and yards systems are universal along the subway system. Each has a useful life of 25 years, with the exception on the OCC. The useful life of the OCC is based on availability of spare parts for computers, which have a life cycle of 5 years.

The current program devotes \$181.2 million toward subway signals. This effort represents 95.1% of the total signal program. The upgrade of the Orange Line signal system is the most significant effort underway in the subway signal program. Other major projects include the upgrade of the Blue Line signal system (a portion of the Blue Line modernization effort) and a systemwide signal infrastructure improvement effort.

## **FUNDED PROJECTS: FY01 – FY06**

Currently, there are six funded projects under subway signals. One effort is comprised of five signal modification projects. The remaining projects include three signal upgrades, a signal installation project and a systemwide signal infrastructure improvement effort. All the signal projects listed below will have a positive effect on the Authority's operating budget by reducing the meantime between functional failure (MTBFF). With newer systems, equipment, and redundancy the mean time to repair a failure will be substantially reduced. By keeping the number of failures and time to make repairs low, overtime to facilitate revenue service will be minimized. These benefits are somewhat offset by deferred replacements on the oldest portions of the signal systems, with the potential for outages increasing over time.

### **Systemwide Signal Modifications:**

#### **Red Line/Systemwide Signal Modifications**

This effort includes signal upgrades of switch machines and replacement of the AVI system for both carbourne and wayside.

#### **Orange Line/Systemwide Signal Modifications**

This project will involve the installation of a Programmable Logic Controller at Oak Grove and will address Non-Vital Logic problems. Also included under this effort is the replacement of the AVI system for both carbourne and wayside.

#### **Green Line/Systemwide Signal Modifications**

This effort includes the replacement of the signal system on the Highland branch from Brookline Village to Reservoir. Also included under this effort are the replacement of the signal power feeder cable and the modification of 2 hand throw crossovers.

#### **AVI System Replacement**

This project includes an AVI system replacement with an upgrade of the operational enhancement and the introduction of updated signal design and maintenance standards for the Red, Orange and Blue Lines. Replacement of the AVI system is in process along the Orange Line.

#### **Systemwide Retirement of the Old Code System**

This effort will focus on decommissioning the 4000 code system antiquated at 10 locations on the Red Line followed by Datatrain IV locations.

#### **Blue Line Signal Upgrade**

The scope of this work will involve the study and upgrade of the signal system along the Blue Line in order to accommodate six-car train service in 2004. This will be performed in conjunction with the Blue Line Modernization effort.

#### **Green Line Lechmere Station Signalization**

This effort will provide signalization at the new proposed Lechmere station.

#### **Orange Line Signal System Upgrade**

The purpose of this project is to design and install a state of-the-art Automated Train Operating (ATO) system on the Orange Line from Chinatown to Oak Grove with interfaces at Wellington Yard and Chinatown. The new ATO system would be compatible with the existing ATO system on the Southwest Corridor and the Orange Line fleet's Automatic Speed Control (ASC). In addition, a new communications link to the OCC will be built.

### Red Line Signal Upgrade/Cable Modifications

The purpose of this project is for the replacement of the existing Generation One Track Modules associated hardware and wiring on the Authority's Red Line. Generation Five Track Modules are presently being installed on the Red Line at 6 locations. This effort will result in more reliable and efficient service.

### Systemwide Subway Signal SMI Efforts

This project represents funding that has been set aside to address subway signal infrastructure needs.

#### Signals—Subway: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Systemwide Signal Mod	\$10.69	\$8.89	\$1.71	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
BL Mod-Signal Upg	\$15.06	\$0.04	\$0.58	\$0.50	\$0.00	\$6.94	\$7.00	\$0.00	\$14.44	\$0.00
GL-Lechmere Signalization	\$8.90	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3.50	\$3.50	\$5.40
OL-Signal Upg	\$89.20	\$1.26	\$8.42	\$19.86	\$19.77	\$20.43	\$16.28	\$3.17	\$79.51	\$0.00
RL-Signal Upg/Cable Mod	\$5.37	\$0.81	\$1.28	\$2.23	\$1.05	\$0.00	\$0.00	\$0.00	\$3.28	\$0.00
Subway Signal SMI Efforts	\$138.53	\$0.00	\$10.43	\$10.80	\$11.19	\$11.60	\$12.02	\$12.47	\$58.09	\$70.01
<b>Total Program</b>	<b>\$267.75</b>	<b>\$11.00</b>	<b>\$22.42</b>	<b>\$33.39</b>	<b>\$32.00</b>	<b>\$38.97</b>	<b>\$35.30</b>	<b>\$19.15</b>	<b>\$158.81</b>	<b>\$75.41</b>

### ANTICIPATED FUTURE NEEDS

Regular maintenance for all signaling components is always needed to maintain safety and reduce operational breakdowns. New signaling technology should also be considered to improve safety and operations, as well as to decrease maintenance costs. The following projects have been identified as subway signal needs.

#### Red Line Signaling Standardization

Long-term issues include signaling standardization using Generation Five Track Modules.

#### Red Line JFK/UMASS/North Quincy

This project would consolidate the cable plant and signal houses at JFK, UMass, and North Quincy stations.

#### Evaluation of Future Technology Study

The Signal Division is looking into the use of Communication Based Train Control (CBTC) for both the Green and Blue Lines.

#### Green Line Systemwide Signal Improvements

The overall condition of signal equipment including interlocking logic, track circuits signaling and switch heater controls will be addressed incrementally. The specific technologies to be used would be identified through the study above.

#### Third Rail Heater Central Control

The project involves the design and implementation of a systemwide third rail heater control system to provide automated shut-on/off from OCC.

#### Systemwide Cable Replacement

Cable replacement is anticipated for cable that have endured premature wearing caused by local conditions.

#### Guilford Yard Signal Installation

This project will consist of the installation of signals at the new Guilford Yard.

#### North Station/Lechmere Stations Signal Upgrades

This effort will consist of an upgrade of the signal systems between North Station and Lechmere.





## SIGNALS COMMUTER RAIL

The Authority's commuter rail signal system consists of over 480 miles of signalized track, 190 miles of aerial pole line, 80 interlockings, 10 train control machines, over 1000 signal head, 476 electric switches and 200 grade crossings with automatic protection equipment. There are 35 bungalows and 52 bungalow/houses in the commuter rail signal system. They all have a useful life of 25 years. Two systemwide signal units are the wayside system and the OCC signal equipment. Both systems have a 25-year useful life.

Annual replacement of under ground signal cable, aerial signal cable, electric switch machines and electric grade crossing mechanisms are required to assure safe reliable signal system within an effective life cycle cost.

The current program devotes \$9.4 million toward commuter rail signals. This effort represents 4.9% of the total signal effort.

### FUNDED PROJECTS: FY01 - FY06

There are two funded projects under the current plan for commuter rail signals. One is a signal upgrade and the other is a systemwide commuter rail signal project. These projects will have a neutral impact on the Authority's operating budget.

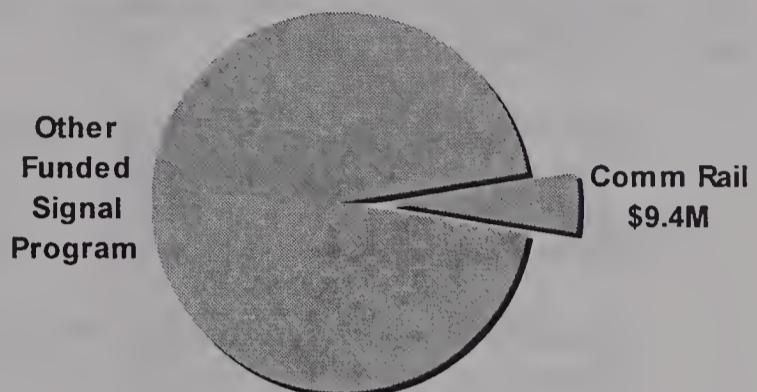
#### Tower A North Terminal

The project encompasses the replacement of 65-year old track and signal components in order to increase running speed and schedule flexibility in the area just north of North Station.

#### Systemwide Commuter Rail Signal SMI Efforts

This project represents funding that has been set aside to address commuter rail signal infrastructure needs.

Funded Signal Program = \$190.6 Million



#### Signals—Commuter Rail: FY01 - FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Tower A North Terminal	\$12.66	\$11.82	\$0.46	\$0.37	\$0.00	\$0.00	\$0.00	\$0.00	\$0.37	\$0.00
CR Signal SMI Efforts	\$17.31	\$0.00	\$1.30	\$1.35	\$1.40	\$1.45	\$1.50	\$1.56	\$7.26	\$8.75
<b>Total Program</b>	<b>\$29.97</b>	<b>\$11.82</b>	<b>\$1.76</b>	<b>\$1.72</b>	<b>\$1.40</b>	<b>\$1.45</b>	<b>\$1.50</b>	<b>\$1.56</b>	<b>\$7.63</b>	<b>\$8.75</b>

## ANTICIPATED FUTURE NEEDS

The future commuter rail signal program will focus on the replacement of outdated technologies with newer equipment that enhances flexibility. Obsolete code systems (which provide signal control from remote locations) are still in use, as are obsolete coded track circuits that require high maintenance. Open wire polelines are susceptible to wind and ice damage, creating maintenance and safety concerns. The following projects have been identified as future needs for commuter rail signals.

### **Haverhill Line West Route: Signal Improvements**

The scope of this project is to enhance train throughput on the West Route main line. Other tasks include the design and installation of a power switch at Ash St. Reading and the redesign of Wilmington Junction Interlocking as a universal crossover between the Wildcat and WRML.

### **Haverhill Line West Route Signal Code System Upgrade**

This project consists of the replacement of the existing GRS type K code system and open line wire along the right of way with Harmon HP1 code equipment.

### **Haverhill Line Andover/Rosemont Signal Upgrade**

The project involves the upgrading of the signal system to a modern bi-directional centralized Traffic Control System (TCS) on the West Route from Andover Street to Rosemont with new CP's at Bradford and Rosemont.

### **West Street Bridge Cable Replacement**

The project involves the replacement of cable along the West Street Bridge.

### **Fitchburg Line Waltham Tower Elimination**

The purpose of this work is to eliminate the Waltham Tower by replacing field code units with units compatible with the new Computer Dispatch Center.

### **Fitchburg/Willows Signal Upgrade**

This project involves replacing the existing GRS type K code system and open line wire along the right of way with Harmon HP1 code equipment.

### **Gloucester Branch Signal Upgrade**

The purpose of this project is to improve the reliability of the Gloucester branch signal system through a series of tasks: the replacement of the track code system; the installation of a power switch; the elimination of the pole line; and the upgrading of the crossing warning systems.

### **Newburyport East Route Signal Upgrade**

This project provides a signal upgrade from Beverly Junction to Chelsea.

### **Lowell Line Wilmington and Shop Interlocking/Bi-directional Signals**

The scope of this project is to complete the Traffic Control System signal system upgrade on the Lowell Main Line between Wilmington Interlocking and Shop Interlocking.

### **Lowell Line Somerville/Winchester Bi-directional Signals**

The purpose of this project is to complete a Traffic Control System (TCS) signal system upgrade on the Lowell Line between Somerville Junction and Winchester.

### **South Bay Track & Signal—Phase II**

The first part of this effort was completed in the 1990's. The remaining scope includes the design and installation of three additional signal interlockings and minor track work leading into the S&I. This work will support additional system expansion on the southside.



## PROGRAM OVERVIEW

The Communications Department is responsible for a variety of low voltage systems at the MBTA. These include maintenance of an extensive inventory of equipment and overseeing contract services for two-way radio systems, security systems, fire alarms, telephones, police/public call boxes, closed circuit television, public address (PA) systems, Light Emitting Diode (LED) signs, and the Supervisory Control and Data Acquisition (SCADA) system. These systems have been developed over time and vary significantly in age and condition. The MBTA communications system also includes the Operations Control Center (OCC).

### The OCC

The OCC is one of the most automated transit control centers in the world. It consists of proven state of the art computer based technology that permits real-time monitoring and supervisory control of the signal and communication systems for all four-transit lines. It also includes the integration of the Bus Radio System into the OCC communication system. The OCC has a useful life of 25 years.

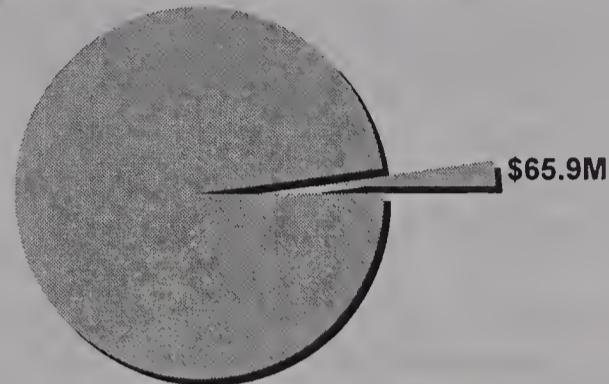
### Telephone Equipment and Services

Telephone equipment has an average useful life of 4 years and includes:

- Electronic key telephones
- Analog telephones
- ISDN equipment
- PENTA voice communications switch (controlling services for the subway and bus dispatch)
- A wayside/emergency telephone network (pump rooms, emergency exits, vent shafts, bungalows, and along the right of ways)

MBTA Capital  
Improvement  
Program  
\$2.91B

Funded  
Communications  
Program  
\$65.9 Million



- A voice messaging system
- 650 public pay telephones
- A network of special services for communications applications
- Network of copper and fiber optic cables

### SCADA II

The SCADA II system monitors and controls equipment (fans, fire alarms, generators, pump rooms, etc.) at remote locations. It includes:

- A main and stand by central processor
- Remote control terminal cabinets

The SCADA II system has a useful life of 20 years.

### Systemwide Security

Systemwide security includes (useful life in parenthesis):

- 28 closed circuit television systems (5 years)
- Public Address (PA)/ signage systems (8 years)
- Security and Alarm system (20 years)
- Fire Alarm systems (15 years)
- Police/public call boxes (10 years)

## **Systemwide Radios**

The current radio system is an analog system and is programmed for replacement with a new digital system to be in place by 2003. Current system components include:

- On-vehicle radios (bus, subway, light rail)
- Non-revenue vehicle radios
- Police mobile radios
- Portable radios
- Base stations and support equipment
- Recorders

All systemwide radios have a useful life of 7 years, with the exception of the base stations and support equipment, which lasts for 25 years.

The current program devotes \$65.9 million toward communications. Communications represents 2.3% of the total capital investment program. The majority of the communications program is devoted towards an upgrade of the Authority's radio communication system.

## **FUNDED PROJECTS: FY01 – FY06**

Currently, there are eight funded projects under the communications program. Most of the projects involve upgrading the Authority's radio communication with new state of the art technology. The systemwide radio upgrade will have a positive impact on the Authority's operating budget. The remaining projects will have a neutral impact upon the operating budget.

### **Operations Control Center (OCC)**

The scope of the ongoing work is to complete the functional and operational requirements set forth in the original RFP.

### **Bus OCC Installation**

This effort will consist of the construction of a new Bus Operations Control Center (BOCC) including voice and data wiring, consoles, computers, AVL equipment and programming associated with the operations of a BOCC.

### **Fire Department Radio System Upgrade**

The project consists of furnishing and installing 17 new base stations at selected locations to service the Boston Fire Department.

### **Communications Equipment**

This effort funds the purchase of telephones and other minor communications equipment. This will improve and upgrade the communication equipment of the Authority.

### **Commuter Rail Information System Installation**

The purpose of this effort is to install state of the art software that will provide real time information for commuter rail passengers.

### **SCADA II/C-Cubed Police Talkback Box Replacement**

This project involves the purchase and installation of ADA compliant assistance telephones and ancillary equipment at existing police talkback locations.

### **Customer Service Phone Installation**

This effort funds the installation an upgraded customer service phone system to handle the 1.6 million annual phone calls the Authority receives. It will also reduce the cost of developing passenger, vehicle and employee schedules and provide for a greater flow of accurate information including enhanced service for hearing impaired customers.

### Systemwide Radio Communications Upgrade

This project seeks to overhaul and expand the existing radio system and to replace the tunnel antenna system. The project will implement an upgraded digital system, taking advantage of 20 channels licensed by the FCC.

#### Communications: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Ops. Control Center	\$16.27	\$15.99	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Bus OCC Installation	\$2.10	\$0.00	\$2.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fire Dept. Radio Sys Upg	\$2.25	\$1.36	\$0.16	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Communications Equip.	\$2.12	\$1.65	\$0.44	\$0.02	\$0.00	\$0.00	\$0.00	\$0.00	\$0.02	\$0.00
Commuter Rail Info System	\$4.70	\$0.00	\$0.70	\$3.00	\$1.00	\$0.00	\$0.00	\$0.00	\$4.00	\$0.00
SCADA II/Police Talkback	\$0.38	\$0.00	\$0.00	\$0.10	\$0.10	\$0.18	\$0.00	\$0.00	\$0.38	\$0.00
Customer Service Info Sys.	\$2.30	\$0.00	\$0.30	\$1.13	\$0.77	\$0.10	\$0.00	\$0.00	\$2.00	\$0.00
Syst Radio Comm Upg	\$59.00	\$3.45	\$4.21	\$22.95	\$17.38	\$11.01	\$0.00	\$0.00	\$51.34	\$0.00
<b>Total Program</b>	<b>\$89.11</b>	<b>\$22.45</b>	<b>\$8.19</b>	<b>\$27.20</b>	<b>\$19.25</b>	<b>\$11.28</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$57.73</b>	<b>\$0.00</b>

### ANTICIPATED FUTURE NEEDS

In order to improve operations throughout the system, communication upgrades are anticipated including new Public Address (PA) equipment and new mobile radios. Without system upgrades, the communications program would experience operational and maintenance inefficiencies, which could increase maintenance costs in the future. The following projects have been identified as future needs for communications.

#### New Public Address System

New PA equipment and fiber optic links for 33 stations are assumed for installation. Also replacement of Voice Storage Units with modern digital system, existing visual message signs and control systems should also be addressed.

#### Radio Purchase

This project consists of the purchase of portable radios as necessary to insure worker safety along the MBTA right of way.

#### OCC Backup Center

Backup control systems would be utilized in case of OCC failure.

#### Active Train Summary System - Commuter Rail OCC (CROCC) Enhancement

The computer dispatching system currently being installed at the Commuter Rail Operations Control Center includes a feature which provides a Real Time Active Train Summary display for the lines controlled by the CROCC. This project will extend the Real Time Active Train Summary to include trains on line segments dispatched by Guilford and Amtrak, allowing this one system to encompass virtually the entire commuter rail system.

#### Installation of Systemwide Emergency Wayside Telephones

The project will involve the replacement of existing wayside emergency telephones located between Oak Grove and Chinatown stations on the Orange Line, between Braintree and Central stations on the Red Line and on the Green Line from Lechmere to Riverside, Boston College, and Cleveland Circle stations.

#### Fire Alarm Upgrades

This effort would upgrade various Authority locations as called for in latest National Fire Protection Association (NFPA) code standards.

**Communication Rooms Refurbishment**

This project would rehabilitate or replace power, lighting, HVAC units and structural problems at various communication rooms throughout the subway system.

**Fiber Optic Cable Network**

The purpose of this project would be to increase the fiber optic cable network by installing single mode fiber optic cable along the Red and Green Lines.

**Remote Control and Monitoring Units (RCMU) Replacement**

This effort will replace the remaining antiquated emergency vent fan remote control and monitoring units (RCMU) with programmable logic controllers (PLC).



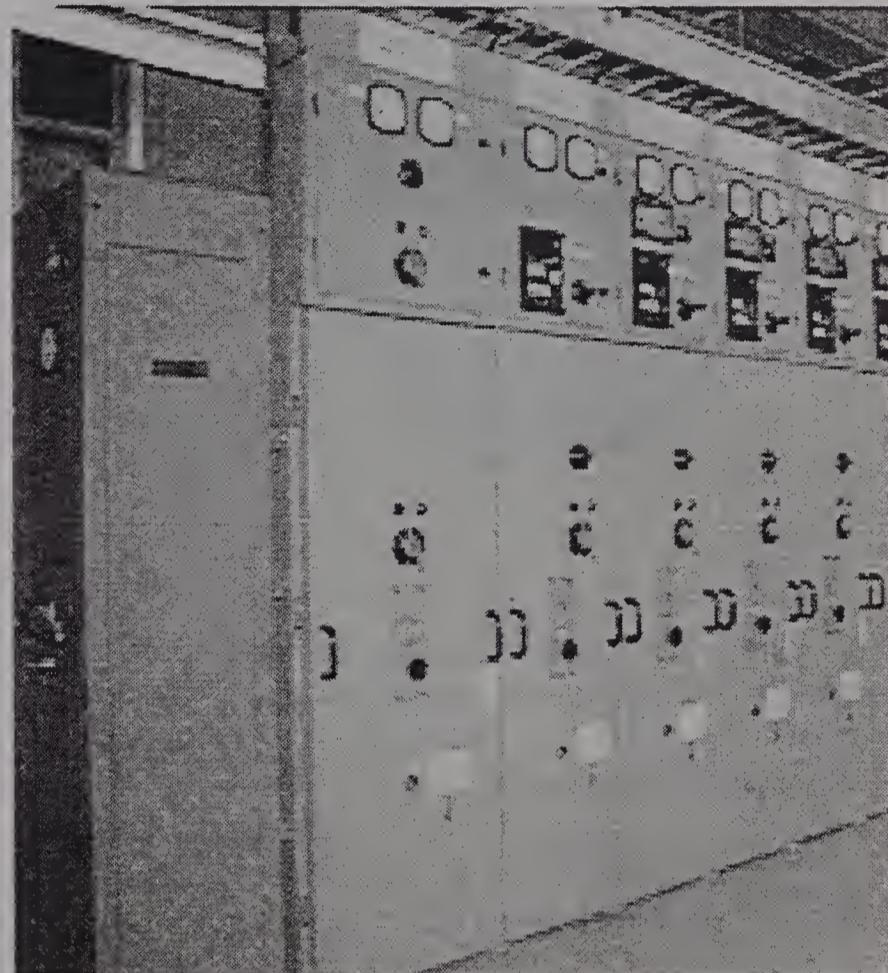
## PROGRAM OVERVIEW

For the subway, trackless trolley and light rail, the MBTA runs power, supplied by Boston Edison, through its own distribution equipment. The power system includes cables, substations, circuit breakers, switch boxes, switch heaters, manholes, ductiles (as well as storage facilities for cable and power equipment), switchboards and circuit breakers. The power program also includes the catenary systems for the Green, Blue, and Trackless Trolley Lines.

The commuter rail system electrical network provides lighting and power for signal systems, communication systems, lift bridges, buildings, stations, parking lots, maintenance facilities, layover facilities, and grade crossings.

The power program is also responsible for lighting at the following five ferry facilities: Lovejoy Wharf, Hingham Shipyard, World Trade Center, Long Wharf, and the Charlestown Navy Yard.

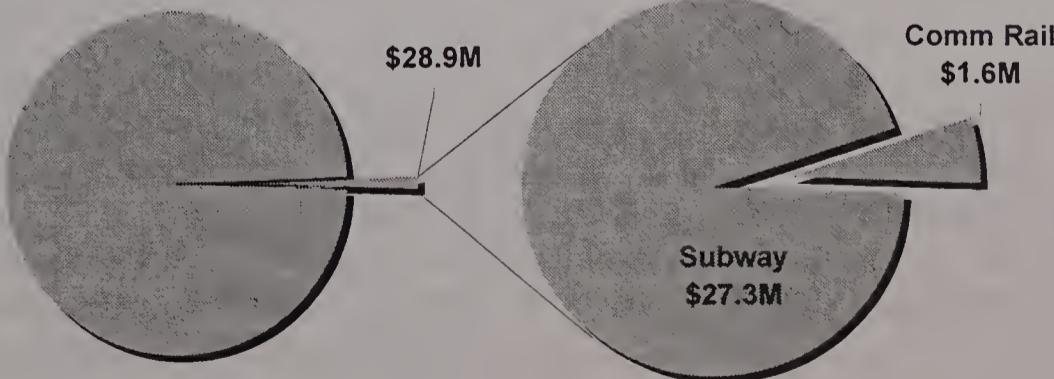
The current program devotes \$28.9 million toward power. Power represents 1.0% of the total capital investment program. Most of the current power program is devoted to the construction of a new traction power substation for the Blue Line.



A power unit at a MBTA facility.

MBTA Capital  
Improvement  
Program  
\$2.91B

Funded  
Power Program  
\$28.9 Million







## **POWER** **SUBWAY**

Subway power covers all aspects of the Authority's rapid transit and light rail power needs.

- **Power Substations**

The subway power division maintains substation equipment to convert 13.8kV AC transmission level power down to 600 volt DC distribution level power to feed third rail subway loads and 480 volt AC distribution power for passenger stations, vent shafts, and signal bungalows. Substation equipment is expected to last 30 years. In addition, the Green line has track switch equipment, which has a useful life of 15 years.

- **Unit Substations**

Unit substations loads are various and include systems necessary for transportation, specifically the signal feeds, and other systems that protect both the customers and the system. There are 48 unit substations along the subway system: 16 on the Red Line, 10 on the Green Line, 18 on the Orange Line, and 4 on the Blue Line. All substations are required to be within close proximity of the equipment they power. The useful life of a unit substation is 20 years.

- **Traction Power Substations**

There are a total of 48 traction power substations throughout the subway system: 25 on the Red Line, 7 on the Orange Line, 9 on the Green Line, and 7 on the Blue Line. Traction power stations have a useful life of 20 years.

- **Cable**

The MBTA has over 3 million feet of AC cable distributed amongst the four subway lines. All AC cable has a useful life of 40 years, except along the Green Line, where the useful life is 15 years. The Orange Line has over 600,000 feet of H-N negative cable, which has a useful life of 20 years. Also, there are 18 SWC MODs and cable on the Orange line and these cables have a useful life of 15 years. The Green Line has about 750,000 feet of DC feeder cable. The useful life of the DC cable is 30 years.

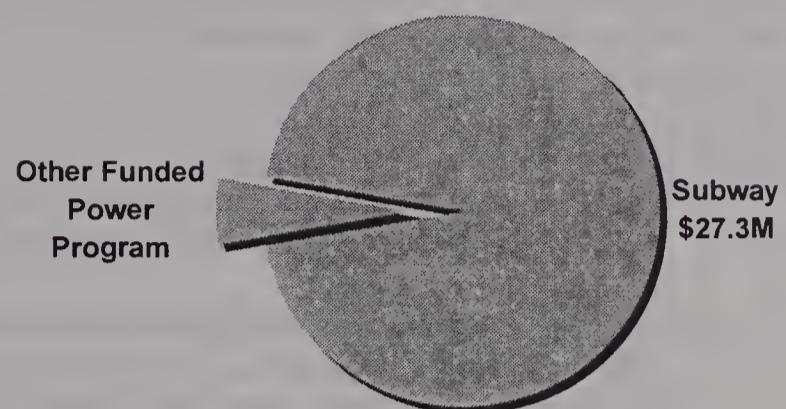
- **Overhead Contact System (OCS)**

Overhead Contact Systems (OCS) are located along the Green and Blue Lines, and on the Mattapan Highspeed line. These systems have a useful life of 20 years.

- **Passenger Low Voltage Switchgears**

There are 54 passenger station low voltage switchgears along the rapid transit and light rail system. Low voltage switchgears feed power to the subway signal system, pump rooms, car houses, escalators, elevators and other various areas of the Authority where power is required. These systems offer protection for customers, Authority equipment, and the system overall. Along the Red and Orange Lines, these systems also feed fire alarm systems, Amtrak and subway signal systems, ventilation, elevators, escalators and various other equipment. Passenger low voltage switchgears have useful lives ranging from 20 to 30 years.

**Funded Power Program = \$28.9 Million**



The current program devotes \$27.3 million toward subway power. This represents 94.6% of the power efforts programmed over the next six years. The most significant effort in this program is the construction of a new power substation and vent shaft, as part of the Blue Line modernization project.

## FUNDED PROJECTS: FY01 – FY06

The Authority has two funded projects under the subway power in the current plan. One is a cable replacement and the other is a system upgrade, associated with the Blue Line modernization project. These projects will have a neutral impact on the Authority's operating costs.

### Blue Line Negative Returns

This project encompasses the replacement of negative return cables between Maverick Station and Orient Heights Station. This will increase reliability and reduce maintenance costs.

### Blue Line Modernization: Aquarium Traction Power (and Ventilation)

The project is the construction of a traction power substation and vent shaft building at Chatham Row and State Street. This effort will provide a new power source for the Blue Line and enable transformation of the old source to power the South Boston Transitway vehicles.

#### Power—Subway: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
BL-Negative Returns	\$3.31	\$1.39	\$1.71	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
BL-Power/Vent shaft	\$32.05	\$6.43	\$8.55	\$8.53	\$8.53	\$0.00	\$0.00	\$0.00	\$17.07	\$0.00
<b>Total Program</b>	<b>\$35.36</b>	<b>\$7.82</b>	<b>\$10.27</b>	<b>\$8.53</b>	<b>\$8.53</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$17.07</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE NEEDS

The power system regularly needs replacement of cables, circuit breakers, manholes, ductiles, and unit substations, as well as storage facilities for cable and power equipment. It is necessary to inspect and repair the exhaust stacks on the gas turbine generator engine (the MBTA's emergency generator), update the engine contracts with the latest technology and safety devices, conduct periodic maintenance on circuit breakers, replace aging cables, manholes, and ductiles, and refurbish aging and overloaded substation buildings. The following projects have been identified as future needs for the subway power program.

### Red Line Substation Improvements

This would refurbish substation buildings and replace all the internal operating equipment at Columbia, Tenean, North Quincy, Wollaston, Quincy Center, Quincy Adams, Porter Square and Alewife. It would also upgrade Cabot substation and along the Mattapan Branch, as well as perform cable installation in various locations.

### Davis Square Upgrade

The project involves the replacement of 480 HVAC cables with surface mounted systems at Harvard, Davis, and Alewife stations.

### Red Line Traction Power Upgrade

The project involves the rehabilitation of all traction power stations along the Red Line.

### Blue Line Power Upgrade

The project involves the replacing of the passenger station unit substations (one substation being done as part of Blue Line modifications).

### **Blue Line Yard Catenary**

The project encompasses the complete replacement of the OCS system in the Orient Heights Yard, as well as other areas along the line.

### **Blue Line Power Supply (Wonderland)**

The project involves the installation of two AC cables from Orient Heights substation to Wonderland substation. Also, all substation buildings will be refurbished and all the internal operating equipment replaced.

### **Orange Line Substation Improvements**

This project would refurbish the substation buildings and replace all the internal operating equipment for substations Wellington, Malden, and Oak Grove. Passenger station upgrades are needed at Oak Grove, Malden, Wellington, Wellington Shop, Sullivan Square, Community College, and North Station as well.

### **Orange Line Cable Upgrade**

This project would replace and remove from the manholes all manhole cable switches on the Southwest Corridor.

### **Orange Line Negative Return System Upgrade**

The project involves the installation of negative return cables from substations to trackway along the Orange Line.

### **Orange Line Power Improvements**

The project involves the installation of AC cable and DC breakers along the Orange Line.

### **Red Line Cabot DC Breaker Replacement**

The project involves the replacement of DC breakers at Cabot switch houses.

### **Red Line Cabot Carhouse Substation Replacement**

This project would include replacement of the line and load side breakers, associated enclosures, feeder cables and control circuits, and the removal of all existing equipment at the existing unit substation at the Cabot RTL carhouse facility.

### **Green Line Substation Improvements**

This project would refurbish the substation buildings and replace all the internal operation equipment at Riverside, Reservoir and internal operating equipment only at 45 High Street. A substation upgrade is anticipated at Riverside.

### **Green Line Catenary Replacement**

This project would replace the complete OCS system on Commonwealth Avenue, Lake Street Yard, Lechmere, Reservoir Yard, and Huntington Avenue.

### **Green Line Cable Upgrade**

Two AC cables would be installed from Coolidge substation to Reservoir substation. Also, track switches, controls and heaters would be replaced along the Green Line and DC cable feed from Oak Square to Watertown Square would be upgraded.

### **Green Line Vent Shaft Upgrade**

The purpose of this project is to upgrade all vent shaft AC cables to accommodate the increase loading.

### **Green Line Highland Branch AC Replacement**

The project involves the replacement of old, deteriorated Aerial AC traction power cables with new state of the art AC cables, along with attachments to newly installed catenary beams along the Highland branch.

### **Green Line Viaduct, Conduit, and Cable**

The purpose of this project is to replace the ductiles between North Station and Lechmere.

### **Green Line Government Center Substation Replacement**

The project encompasses the replacement of the existing BECO equipment and the substation that power tunnel ventilation fans, Blue and Green Line signals, pump room and station lighting.

**Orange Line/Green Line Negative Return Cable**

The purpose of this effort is to upgrade DC negative return system on the Orange and Green Lines.

**Green Line/Blue Line Section Insulator Replacement**

This project consists of the removal of existing heavy outdated section insulators, and replacing them with new lightweight state of the art design double beam section insulators on entire Green Line and Orient Heights Yard.

**VDC Emergency Lighting Systems Replacement**

The purpose of this project is to replace all 125 VDC emergency lighting systems at 10 stations on the Blue and Red Lines.

**Waverly Power (Feeder Cables)**

This effort would replace the existing trolley wire and feeder cables used to supply the Waverly branch of the trackless trolley system to insure a double contingency operation in order to prevent service interruptions in the event of a substation being knocked off line.

**Exhaust Stack A Rehabilitation**

This project would involve the rehabilitation of the Exhaust A jet engine.



**POWER  
COMMUTER RAIL**

The commuter rail electrical system provides lighting and power for signal systems, communication systems, bridges, buildings, stations, parking lots, maintenance facilities, layover facilities (Bradford, Needham and North Station), and grade crossings. It also provides redundant power at critical facilities and cables to operate mechanical power on the Beverly Drawbridge.

• **Signal Systems**

The commuter rail power programs responsible for maintaining 366 switch heaters and 24 gas switch heaters. Both switch and gas switch heaters have 20-year useful lives.

• **Layover Facilities**

Each layover facility control center has a 20-year useful life.

The current program devotes \$1.6 million toward commuter rail power. This effort represents 5.4% of the total power program effort. The majority of this effort is for the construction of equipment at Readville Yard.

**FUNDED PROJECTS: FY01 – FY06**

There are two projects in the current plan for commuter rail power. One addresses head-end power at various facilities and the second involves the installation of power at Readville Yard. Both projects will have a neutral impact on the Authority's operating budget.

**Commuter Rail Head End Power Replacement**

This effort supplies temporary head-end engine power at power at commuter rail layover facilities.

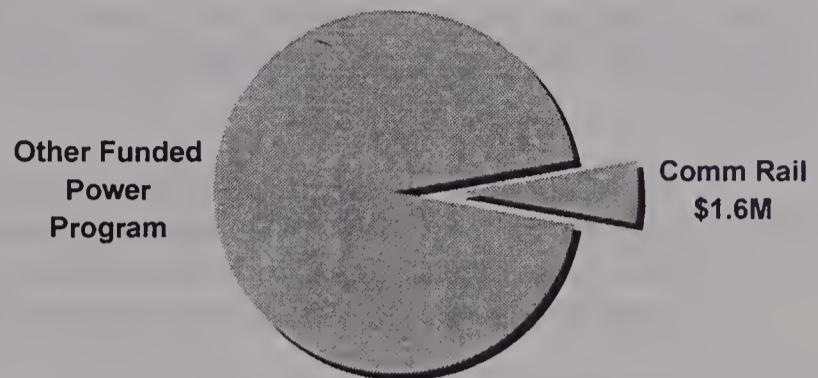
**Readville Yard Layover Plug-In**

This project would allow the construction of bare basic plug-in capacity at the Readville Yard. This will mitigate engine noise and significantly reduce noise levels in the Readville area.

Power—Commuter Rail: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
CR Head End Repl.	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Readville Yard Plug-in	\$1.75	\$0.18	\$1.08	\$0.49	\$0.00	\$0.00	\$0.00	\$0.00	\$0.49	\$0.00
<b>Total Program</b>	<b>\$2.20</b>	<b>\$0.18</b>	<b>\$1.08</b>	<b>\$0.49</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.49</b>	<b>\$0.00</b>

**Funded Power Program = \$28.9 Million**



## ANTICIPATED FUTURE NEEDS

Improvements and upgrades to the electrical system are anticipated to avoid train delays and service interruptions. All outdated navigation lights, direct buried cable, outdated control components and circuits, and transformers will be replaced, and all switches associated with the 4160V-power distribution system will be disconnected. This corrective action will enhance system reliability and prevent power failures. Periodic inspections and maintenance will continue on all power equipment and electrical units. The projects below are anticipated future project for commuter rail power.

### **Commuter Rail Systemwide Electrical Infrastructure Enhancements**

The project involves the following tasks: the upgrade of electrical controls for Beverly draw to replace antiquated electromechanical system; and the installation of test location for remote operation of and communications with passenger information signs and electrical data from stations, parking lots and facilities.

### **Passenger Station Generator Purchase**

This project involves the purchase and outfit of a 200KW generator that will allow emergency operation of passenger stations.

### **Switch Heater Replacement**

This project involves the installation of 2 complete sets of switch heaters and also installs test locations for remote operation of and communications with switch heaters.

### **Newton Lighting Fixtures**

This project entails the replacement of 60 pole mounted lighting fixtures at three stations in Newton.

### **Emergency Lighting Tower Purchase**

This project involves the purchase of 2 tow-able emergency lighting towers with generators.

### **Mystic Junction**

This project composes of the installation of a transformer containment yard at Mystic Junction.

### **Fitchburg Commuter Rail Layover Facility Power**

Due to the lack of local power, trains must use a temporary electric layover facility while laying over in Fitchburg. This project entails the installation a complete power system and new track layout.

### **Layover Unit Substations Fans & Vents Installation**

This project will install additional ventilation fans and powered louvers controlled by an over-temperature alarm, and install variable air volume controls on the existing AC units at the Worcester, Kingston, Middleboro, and Newburyport layover facilities.



## POWER SYSTEMWIDE

Systemwide power covers the main distribution system as well as the back-up generators. This section also covers the catenary system for the trackless trolley.

- **South Boston Power Complex Gas Turbines**

The MBTA owns and maintains 2 emergency back-up generators in South Boston. They exist primarily to provide power to the Authority's power grid if the BECo 115kV lines are lost. The jet turbine units and switch stations were built in the 1980's and provide backup power to 80% of the system. Each unit has a useful life of 25 years.

- **Supervisory Systems**

The Power division maintains two supervisory control systems, which allow for continuous remote monitoring and control of all power facilities. The primary system, called SCADA, employs two VAX computers that constantly poll all traction substations and presents the received data out on to four workstation consoles located at Power Control. The backup system, called "One on One", employs a simplified system of point to point communication between microprocessors located the Cabot Control Center and the field sites. The received data is mapped on to an array of LEC lamps, which are read by dispatch personnel. The system has a useful life of 25 years.

- 

- Substation Equipment**

Traction power substation equipment is used to convert 13.8 kV AC transmission level power to 600 volt DC distribution level power to feed third rail subway loads and 480 volt AC distribution power level for passenger stations, vent shafts, and signal bungalows. The equipment used in the process consist of 15 kV rated AC switchgear, rectifier transformers, DC rectifiers, 600 volt rated DC switchgear, unit power transformers, station batteries, and supervisory control units. Substation equipment has an useful life of 25 to 30 years.

- **Unit Substations**

There are 65 unit substations (USS) throughout the Authority. Unit substations provide power to lights, vents, and fans. The USS loads are various and include systems necessary for transportation, specifically the signal feeds, and other systems that protect both the customers and the system. Substations are required to be in close proximity of the equipment they power. The useful life of an unit substation is 20 years.

- **Substations**

There are 10 substations: 7 located at Charlestown, 2 located at Everett Shops, and one rapid transit/light rail central control at 45 High street. These substations were built in the 1970's. The useful life of a substation is 25 years.

## FUNDED PROJECTS: FY01 - FY06

*Currently, there are no projects for systemwide power.*

## ANTICIPATED FUTURE NEEDS

The following future efforts have been identified as needs for the systemwide power program.

### **Trackless Trolley Catenary and Pole Replacement**

The purpose of this program is to replace complete OCS system throughout the North Cambridge Yard, install new track switches, controls and heaters, and replace all DC feeders supplementing the traction power.

### **Engine A Exhaust Stack Replacement**

This project involves the removal and/or demolition of the existing exhaust stack. It also encompasses the design, manufacture, and installation of a new stack.

### **Systemwide Power Upgrades**

The supervisory control systems controlling the power operation would be replaced, and an overhaul of the OCBs at South Boston Switching Station is anticipated.

### **Power Vehicle Replacement Program**

A program is anticipated to allow the replacement of the wire car used for all OCS maintenance and other maintenance vehicles as they reach their service life.

### **Systemwide AC Cable Replacement Program**

The purpose of this project is to rehabilitate AC unit substations, replace AC lengths, and complete the vacuum conversion of the AC circuit breakers.

### **Charlestown Cable Storage Facility**

This project involves the conversion of a MBTA-owned property in Charlestown into a facility for cable storage.

### **Employee Facility Training Program**

This would construct training facilities for power division employees.

### **Systemwide Power Cable Replacement Program**

This will allow for the provision of storage facilities for cable and power equipment, help replace worn out cable handling vehicles and aging AC and DC cable lengths as well as manholes and ductiles, and also install a 2<sup>nd</sup> "T" cable to accommodate increased system loading.

### **Systemwide Unit Substation Ventilation**

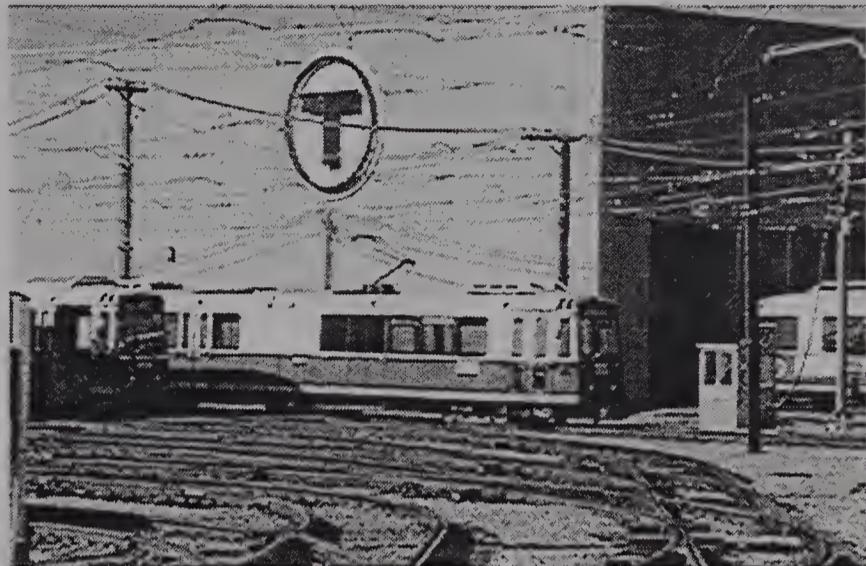
This will install substation ventilation throughout the system.



## PROGRAM OVERVIEW

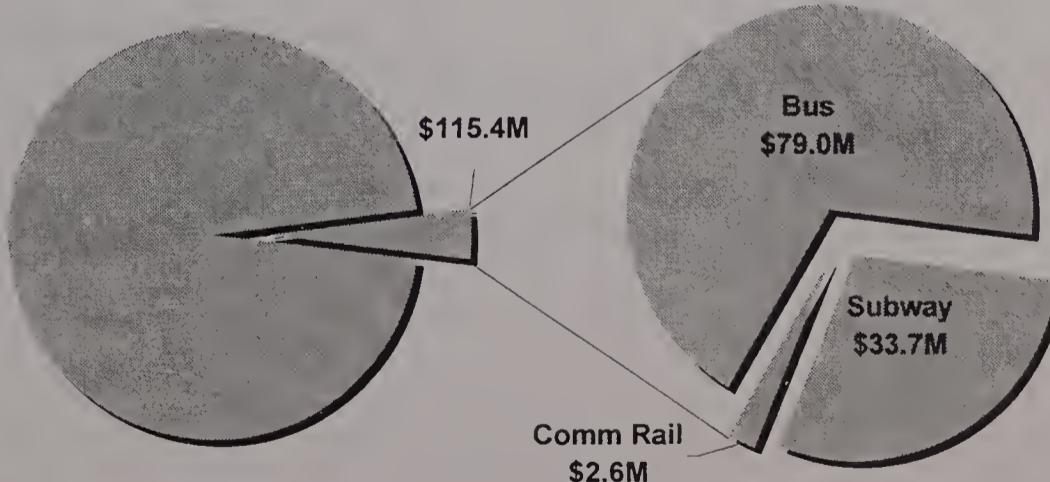
Maintenance facilities, or yards and shops, are where the MBTA conducts regularly scheduled maintenance and emergency repairs on its vehicle fleets. The Authority maintains 4 rapid transit yards and shops, 4 for light rail, 3 for commuter rail, and 9 bus facilities, including a bus repair shop. There are also seventeen smaller general maintenance facilities throughout the system. A new facility is also being constructed to maintain Silver Line vehicles. Each facility generally includes the basic building structure: a roof, a mechanical plant and shop equipment. The expected life cycle of each of these facilities is 50 years.

The current program devotes \$115.4 million toward maintenance facilities. The maintenance facilities program represents 4.0% of the total capital investment program. The current program includes final efforts related to the completion of the new Boston Engine Terminal for commuter rail maintenance, the retrofit of Green and Blue Line facilities to accommodate new vehicle fleets, and the replacement of a 70-year old bus garage. The new Silver Line facility is programmed under the Transitway budget in the System Expansion section.



MBTA Capital  
Improvement  
Program  
\$2.91B

Funded  
Maintenance Facilities  
Program  
\$115.4 Million







## MAINTENANCE FACILITIES

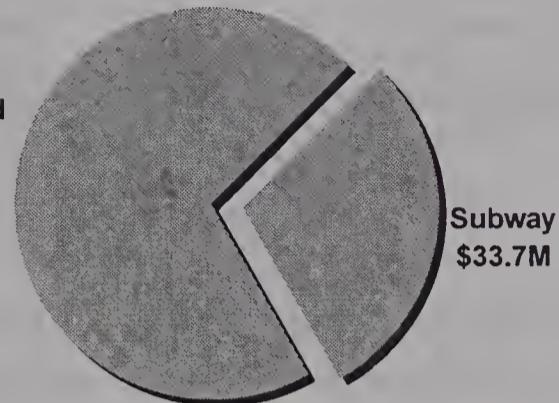
### SUBWAY

Funded Maintenance Facilities = \$115.4 Million

Maintenance facilities for the rapid transit and light rail fleets include:

- A Red Line facility at Cabot
- An Orange Line facility at Wellington
- A Blue Line facility at Orient Heights
- Green Line facilities at Boston College, Riverside, Reservoir, and Mattapan Yard
- A main subway repair facility in Everett

Other Funded  
Maintenance  
Facilities  
Program



All maintenance facilities have useful lives of 50 years. Included under this program are the basic structure of each facility, its roof, and critical maintenance equipment (lifts, hoists, etc.).

The current program devotes \$33.7 million toward subway maintenance facilities. This represents 29.2% of the total maintenance facilities program. Current funding for subway maintenance facilities is devoted toward the modification of the Riverside facility and renovations of the Orient Heights Carhouse as part of the Blue Line modernization project. Both of these efforts are designed to prepare the maintenance facilities to accept new fleets.

### FUNDED PROJECTS: FY01 – FY06

There are currently four projects relating to subway maintenance facilities. One is a rehabilitation effort, and the remaining three are related to the Blue Line modernization project. The projects listed below will have a neutral impact on the Authority's operating budget.

#### Green Line Facility Rehabilitation

Facility modifications are being performed on the Riverside and Reservoir maintenance facilities in order to accommodate the new low floor cars. The project also consists of the installation of a signal system at Grove St. and the replacement of the signal power feeder cable on the Highland Branch.

#### Blue Line Orient Heights Car House Design Efforts

This effort will complete final design efforts required for the Orient Heights carhouse.

#### Blue Line Orient Heights Car House—Phase I

This project is being performed as part of the Blue Line Modernization effort. Phase I will make the required renovations to accommodate six-car trains in the carhouse by 2004.

#### Blue Line Orient Heights Car House—Phase II

This project will complete the modernization of the Orient Heights car house as part of the final phase of Blue Line Modernization.

**Maintenance Facilities—Subway: FY01 – FY06 Projects (\$ in Millions)**

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
GL-Fac Rehab	\$12.30	\$7.98	\$3.17	\$1.15	\$0.00	\$0.00	\$0.00	\$0.00	\$1.15	\$0.00
BL-OH Carhouse Dsn	\$1.33	\$1.33	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
BL-OH Carhouse-Ph. I	\$20.65	\$0.00	\$2.00	\$13.00	\$3.80	\$1.86	\$0.00	\$0.00	\$18.65	\$0.00
BL-OH Carhouse-Ph.II & III	\$14.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2.00	\$6.75	\$8.75	\$5.35
<b>Total Program</b>	<b>\$48.38</b>	<b>\$9.31</b>	<b>\$5.17</b>	<b>\$14.15</b>	<b>\$3.80</b>	<b>\$1.86</b>	<b>\$2.00</b>	<b>\$6.75</b>	<b>\$28.55</b>	<b>\$5.35</b>

**ANTICIPATED FUTURE NEEDS**

The following projects have been identified as future needs for subway maintenance facilities.

**Red Line**

This project would replace the Cabot facility and expand the shop, the office and staff facilities.

**Orange Line**

This effort would renovate the Wellington facility. It would also add a second rinse unit and construct a separate storage facility for non-revenue vehicles.

**Green Line**

This project would replace all the overhaul doors on the Reservoir facility on the service needs all of its overhead doors replaced. The lifts perform minor repairs are needed to the brick exterior.

**Systemwide Vehicle Washing Replacement**

Vehicle washing systems throughout the system must replaced with a recycle wash system to reduce high water and sewer charges. All wash equipment will be modified to accommodate a water stripper system.

**Everett Compressor Systems Replacement**

The project involves the rebuilding of the compressor room at Everett Boiler Facility to replace two units out-of-service and two units outside in temporary structure.



## MAINTENANCE FACILITIES COMMUTER RAIL

Commuter rail maintenance facilities include the Boston Engine Terminal in Somerville, the Storage and Inspection facility in South Boston, and the Light Inspection facility in Readville.

- The Boston Engine Terminal (BET) is a new state of the art facility consisting of over 8 acres under one roof, located in Somerville. The building consists of areas for service and inspection, periodic maintenance, wheel truing, coach repair and locomotive repair together with allied shops.
- The South Side Service and Inspection Facility is a two track structure located at Wydett Circle in South Boston. This facility can accommodate two 9 car trains and has fueling and sanding capabilities and ability to perform running repairs.
- The Readville Light Inspection facility was constructed at the same time as the BET. It is a butler type building consisting of three tracks and capable of holding six coaches. It is dedicated to special projects such as retrofits, wheel truing and ACSES installation.

Commuter rail maintenance facilities, including the basic structure, its roof, and critical maintenance equipment, have a useful life of 50 years.



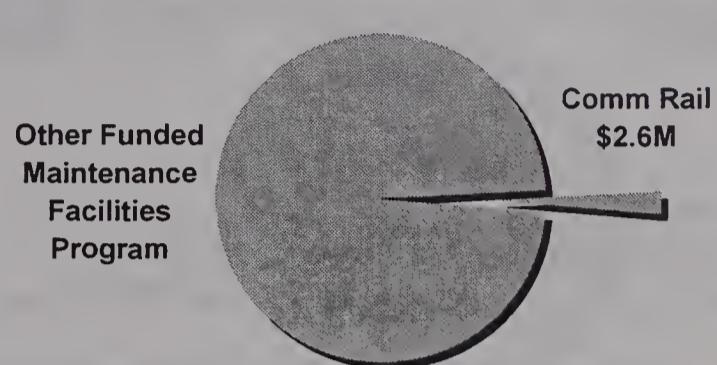
### Boston Engine Terminal (BET) Equipment and Move-In Modifications

The project involves the supply of tools, equipment, furniture and end-user lighting and heating modifications for the facility, as well as to fund the transition of the operating contractor and the MBTA into the newly built Commuter Rail Maintenance Facility-Boston Engine Terminal.

### Boston Engine Terminal (BET)

The construction of the commuter rail maintenance facility was completed in 1998. Remaining efforts include the construction of a groundwater extraction and treatment system, final punchlist items and drainage work. This work will conclude the construction of the BET. \_

Funded Maintenance Facilities Program = \$115.4 Million



The current program devotes \$2.6 million toward commuter rail maintenance facilities. This represents 2.3% of the total maintenance facilities program. The funding devoted toward commuter rail maintenance facilities represents the remaining elements to finalize the new Boston Engine Terminal.

### FUNDED PROJECTS: FY01 - FY06

Currently, two projects are underway, both involving final punchlist items and equipment for the Boston Engine Terminal. One completes drainage work at the facility, and the other provides equipment for the facility. Both projects will have a positive impact on the operating budget.

**Maintenance Facilities—Commuter Rail: FY01 – FY06 Projects (\$ in Millions)**

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
BET Build. Mod.	\$2.93	\$2.65	\$0.28	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
BET	\$149.34	\$144.98	\$2.01	\$0.35	\$0.00	\$0.00	\$0.00	\$0.00	\$0.35	\$0.00
<b>Total Program</b>	<b>\$152.27</b>	<b>\$147.63</b>	<b>\$2.29</b>	<b>\$0.35</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.35</b>	<b>\$0.00</b>

**ANTICIPATED FUTURE NEEDS**

The following projects have been identified as future needs for commuter rail maintenance facilities.

**Maintenance Facility Upgrade Program—Readville**

An upgrade program for replacement of the Readville facility is anticipated.

**Maintenance Facility Upgrade Program—South Bay Service and Inspection**

A future upgrade program is anticipated for the Service and Inspection facility. Included under this program is the installation of new vandal proof stations with features required for Phase II firefighter service, and install two new firefighter service panels, complete with all control wiring.

**Mid-day Layover Facility**

The project involves the design, acquisition, and construction of additional mid-day storage for Southside operations.

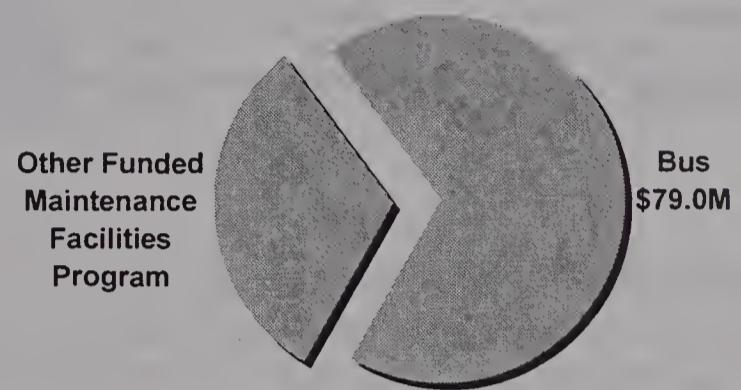


## MAINTENANCE FACILITIES BUS

Funded Maintenance Facilities Program = \$115.4 Million

The Authority maintains 8 bus garages and a central bus repair shop.

- Albany Street (built in 1941)
- Bartlett (built in 1931)
- Cabot (built in 1924)
- Charlestown (1970s)
- Fellsway (built in 1925)
- Lynn (built in 1936)
- Quincy (built in 1930)
- Somerville (1970s)
- Everett Central repair shop



Bus maintenance facilities have a useful life of 50 years. Included under this program are the basic structure of each facility, its roof, and critical maintenance equipment (lifts, hoists, etc.).

The current program devotes \$79.0 million toward bus maintenance facilities. This represents 68.5% of the total maintenance facilities program. The majority of the funding is for the design and construction of a new bus facility to replace Bartlett.

### FUNDED PROJECTS: FY01 – FY06

There are four projects under bus maintenance facilities. The projects will have a neutral impact on the Authority's operating budget.

#### Miscellaneous Facility Improvements: Roof Replacement

This roof replacement program includes funding for the Light Maintenance Facility in Charlestown. It will replace aging infrastructure and reduce maintenance costs. Future efforts under this program include work at non-bus facilities.

#### Arborway Bus Garage—Phase I

The project involves the design and construction of a bus maintenance facility at the Arborway Yard. This new facility would replace the aging and undersized Bartlett Street garage.

#### Southampton Street Administration Facility

This project involves the design and construction of a 76' CNG and alternative fuel bus maintenance and storage facility in South Boston.

#### CNG Facility Construction

This project involves the conversion of existing facilities to fuel, store and maintain CNG buses at various locations.

**Maintenance Facilities – Bus: FY01 – FY06 Projects (\$ in Millions)**

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Misc Roof Rehab	\$1.60	\$0.53	\$0.60	\$0.46	\$0.00	\$0.00	\$0.00	\$0.00	\$0.46	\$0.00
CNG Facility Constr.	\$20.00	\$0.00	\$3.25	\$7.50	\$8.50	\$0.75	\$0.00	\$0.00	\$16.75	\$0.00
Southampton St. Facility	\$25.00	\$0.00	\$4.00	\$9.00	\$9.00	\$3.00	\$0.00	\$0.00	\$21.00	\$0.00
Arborway Garage-Ph. I	\$35.00	\$2.04	\$1.54	\$10.99	\$13.23	\$7.20	\$0.00	\$0.00	\$31.42	\$0.00
<b>Total Program</b>	<b>\$81.60</b>	<b>\$2.58</b>	<b>\$9.39</b>	<b>\$27.95</b>	<b>\$30.73</b>	<b>\$10.95</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$69.63</b>	<b>\$0.00</b>

**ANTICIPATED FUTURE NEEDS**

There are two specific future projects anticipated by the Authority. In addition, due to the aging of the bus facilities, various exterior structural projects are also anticipated.

**Lynn Garage Fire Alarm Upgrade**

The objective of this project is to modify and replace the fire protection system at the Lynn garage and retail space.

**Charlestown Compressor Systems Replacement**

The project involves the replacement of the existing spent compressors with new compressors and air dryers at the Charlestown Bus Repair Garage.



## MAINTENANCE FACILITIES

### Systemwide

Systemwide maintenance facilities include structures and buildings that the Authority uses for various tasks and purposes. There are sixteen systemwide maintenance facilities and they are as follows:

- Cabot Heating Plant
- Auto Repair Facility
- Signal Repair Facility
- MOW Training and Backup CC
- Testing Lab
- Arborway Yard
- Oak Square Emergency Garage
- Campbell's Gate MOW
- Truck Storage and Repair
- Rail Bending Shop
- Light Maintenance Shop
- Heavy Maintenance Shop
- Pipefitter's Building
- Materials Storehouse
- Salt Sheds
- Rice Buildings

All systemwide maintenance facilities have a useful life of 50 years. Currently, there are no funds programmed for systemwide maintenance facilities.

### FUNDED PROJECTS: FY01 - FY06

*There are no identifiable projects funded within the current program for systemwide maintenance facilities.*

### ANTICIPATED FUTURE NEEDS

The projects listed below have been identified as future needs for systemwide maintenance facilities.

#### Charlestown Heating Plant

The project involves the installation of a new gas fired boiler system at Charlestown buildings No. 2 and No. 3.

#### Charlestown Roof Replacement

This project consists of the replacement of the rooftop and HVAC at Charlestown.





## PROGRAM OVERVIEW

This program includes all MBTA rapid transit, light rail, Silver Line, and commuter rail stations. There are 248 stations and 19 new stations under design or construction.

This section also includes major bus transfer stations, bus stops, and shelters.

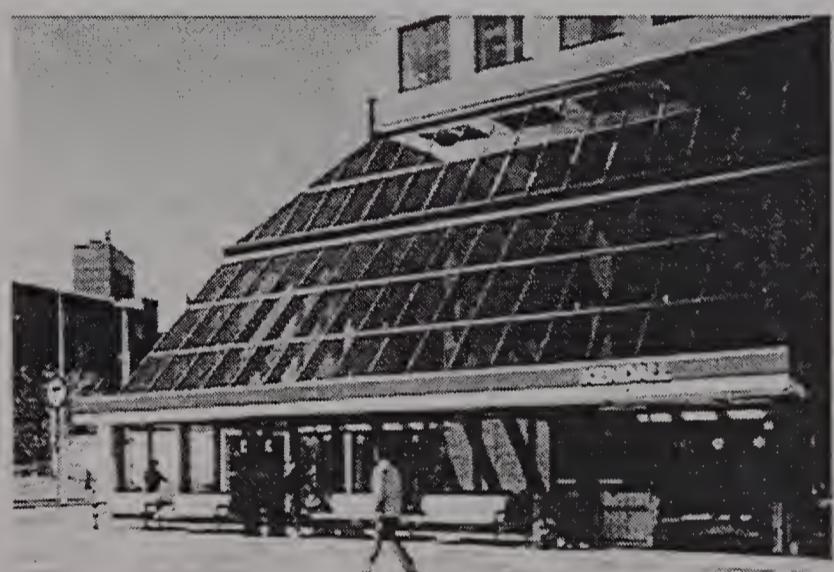
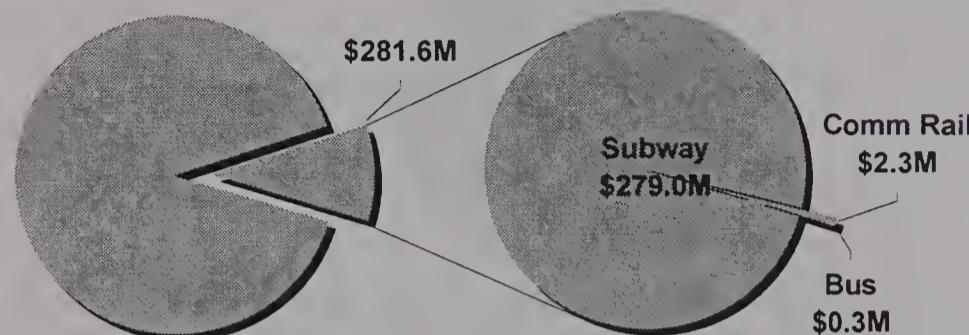
Stations are composed of the basic structure, roofs, platforms, lights, and shelters. Elevators and escalators are included under systemwide facilities. Fare collection equipment and collector booths are included in the fare equipment section of this document.

The current program devotes \$281.6 million toward stations. This represents 9.7% of the current capital investment program. The majority of the current station funding is devoted to subway stations, particularly work to modernize Blue Line stations and to accommodate six-car trains.

Silver Line and Greenbush commuter rail station construction is covered under the System Expansion section of this document. Also, improvements to several existing commuter rail stations are included as part of programmed parking expansions, which is located in the System Enhancement section of this document.

MBTA Capital  
Improvement  
Program  
\$2.91B

Funded  
Stations Program  
\$281.6 Million







## STATIONS SUBWAY

Funded Stations Program = \$281.6 Million

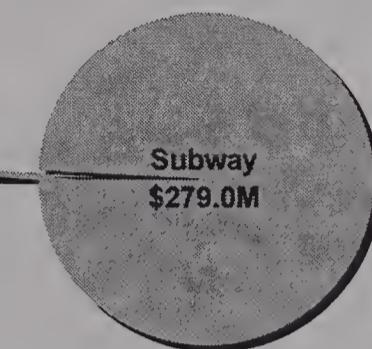
The MBTA has a total of 131 rapid transit and light rail stations, which include 6 shared stations (North Station, Haymarket, State Street, Government Center, Park Street, and Downtown Crossing).

- The Red Line has a total of 22 stations
- The Blue Line has a total of 12 stations
- The Orange Line has a total of 19 stations
- The Green Line has a total of 71 stations, on 4 routes: Boston College/B Line (23 stations), Cleveland Circle/C Line (13 stations), Riverside/D Line (13 stations) and Arborway/E Line (11 stations). The remaining 11 stations are on the Central Subway serving more than one branch.
- The Mattapan Highspeed line has 7 surface stations



Subway stations typically have a useful life of 50 years. The current program devotes \$279.0 million toward subway stations. This represents 99.1% of the funding devoted to stations. The majority of this funding is associated with the Blue Line modernization project and the restoration of the Dorchester Red Line stations.

Other Funded  
Stations  
Program



### FUNDED PROJECTS: FY01 – FY06

There are ten funded projects under the current plan. Five projects (eleven stations) are related to the modernization of the Blue Line, four involve the restoration and modernization of the Red Line Dorchester stations and one is a historic restoration project along the Green Line. These efforts will have a neutral impact on the Authority's operating budget.

#### Green Line Park and Boylston Stations Kiosks

The project will restore the exterior of four historic headhouses (two at Park Street Station, two at Boylston Street Station). The work will include exterior masonry restoration, repair/replacement of windows, new skylights/roof, new transoms and doors.

#### Blue Line Modernization:

##### State Street Station

This project will complete platform lengthening and modernization at State Street station. The intent is to allow this station to serve more passengers and accommodate six car trains.

##### Government Center Station

This project will complete platform lengthening and modernization at Government Center station. The intent is to allow this station to serve more passengers and accommodate six car trains.

##### Maverick/Orient Heights Stations

This project will complete platform lengthening and modernization Maverick and Orient Heights stations to facilitate six car trains along the Blue Line.

#### Blue Line Modernization: Airport Station

The project consists of the design and construction of a new Airport Station approximately 500 feet towards Wood Island Station to coordinate with MHD CA/T and MPA Logan Projects. The project will allow for more efficient transfer of passengers and the accommodation of six car trains.

#### Blue Line Modernization: Aquarium Station Modernization

The project completes platform lengthening and modernization of Aquarium station to accommodate six car trains.

#### Red Line (Dorchester) Modernization:

##### Savin Hill Station

The project consists of the rebuilding of Savin Hill station. The existing head house and platforms will be replaced and the station made ADA accessible. The project is intended to provide easier access for the riding public and a more comfortable and secure environment for passengers.

##### Fields Corner Station

This project will modernize Fields Corner station including a new street level head house, lowering the bus ways and making the station fully accessible. The completion of the project will allow easier access for all patrons, provide better service and enhance intermodal transfers.

##### Shawmut Station

The scope of this project consists of waterproofing the station, making it fully accessible and renovating the head house. The project will enhance the comfort and convenience for the riding public.

##### Ashmont Station

The effort renovates Ashmont station and including a new roof, restoration work on the bus way and PCC viaduct, new furniture and lighting. The project is intended to provide the riding public with a more comfortable and secure environment.

#### Stations—Subway: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
GL-Park/Boylston Kiosks	\$1.88	\$0.05	\$0.84	\$0.99	\$0.00	\$0.00	\$0.00	\$0.00	\$0.99	\$0.00
BL Mod-Airport Stn	\$29.00	\$2.29	\$12.81	\$11.57	\$2.33	\$0.00	\$0.00	\$0.00	\$13.90	\$0.00
BL Mod-Aquarium Stn.	\$109.01	\$56.03	\$15.12	\$14.13	\$7.91	\$5.05	\$10.76	\$0.00	\$37.85	\$0.00
BL Modernization	\$171.80	\$2.52	\$5.29	\$21.96	\$23.34	\$16.72	\$13.76	\$36.25	\$112.03	\$51.97
RL Mod-Dorchester Stns	\$80.17	\$0.00	\$0.59	\$9.87	\$24.01	\$37.57	\$8.13	\$0.00	\$79.57	\$0.00
<b>Total Program</b>	<b>\$391.86</b>	<b>\$60.89</b>	<b>\$34.64</b>	<b>\$58.52</b>	<b>\$57.60</b>	<b>\$59.34</b>	<b>\$32.64</b>	<b>\$36.25</b>	<b>\$244.34</b>	<b>\$51.97</b>

#### ANTICIPATED FUTURE NEEDS

*There are no anticipated future needs for subway stations.*



## STATIONS COMMUTER RAIL

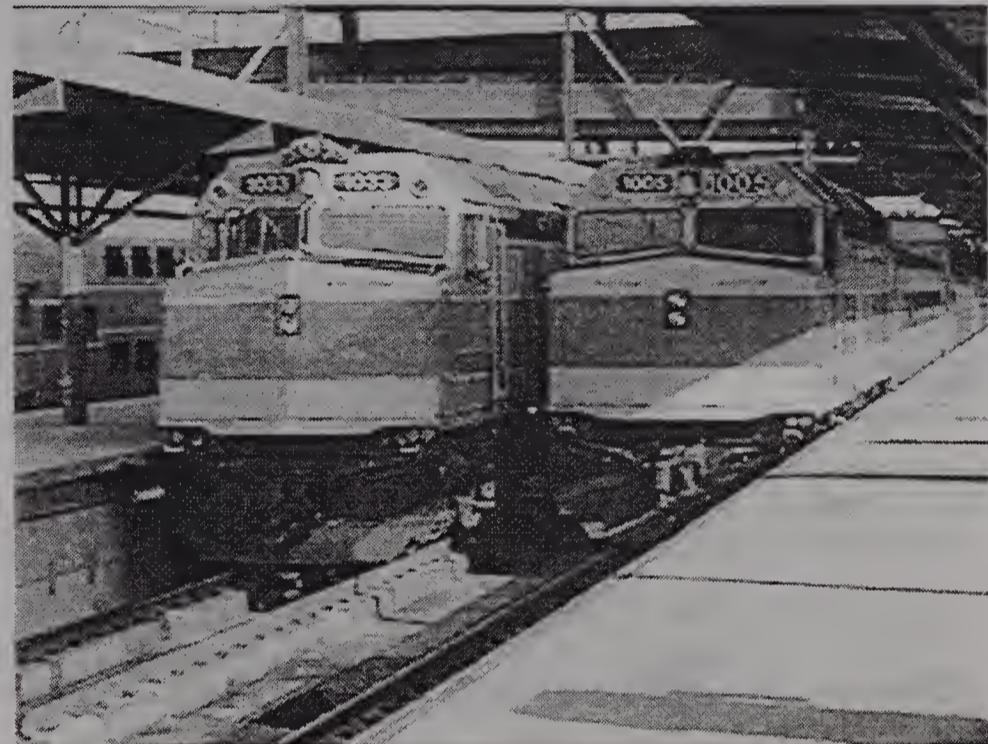
There are four main commuter rail lines on the north side of the system, which terminate at North Station. The south side system has seven lines terminating at South Station. Four of the southside lines also provide service to Back Bay station. The MBTA currently has 125 commuter rail stations on these 11 commuter rail lines:

### North Side

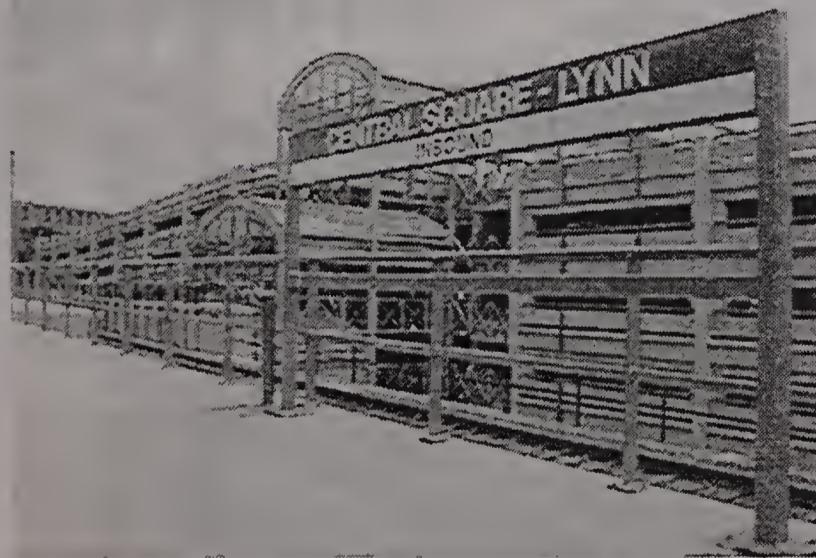
- North Station terminal
- 18 stations on the Newbury/Rockport line
- 13 stations on the Haverhill/Reading line
- 7 on the Lowell line
- 17 stations on the Fitchburg/South Acton line

### South Side

- South Station terminal
- Back Bay
- 15 stations on the Framingham/Worcester line
- 3 stations on the Fairmont line
- 12 on the Franklin line
- 12 stations on the Attleboro/Stoughton line
- 9 stations on the Middleborough/Lakeville line
- 9 stations on the Needham line
- 7 stations on the Plymouth/Kingston line



Commuter rail stations have useful lives ranging from 35 to 70 years, depending upon the structure type. Commuter rail stations generally consist of a low-level platform with lights, shelters, and other components. Mini-high platforms are provided at most stations and full high-level platforms are found along the Old Colony lines, the downtown terminals and at Worcester station.



System expansion will bring four new commuter rail stations online over the next few years including: Southborough, Westborough, and Ashland on the Worcester branch, and JFK/UMass on the Old Colony branch. A new station at the Woburn Regional Transportation Center will replace the adjacent Mishawum station on the Lowell line. Minor commuter rail station improvements are also made as part of parking improvement and expansion projects. Currently, station improvements are programmed being as part of parking projects at the Wilmington and Hamilton/Wenham stations. In, addition, the MBTA's efforts to design and construct the Greenbush and Fall River/New Bedford commuter rail projects are described in the System Expansion section.

Much of the MBTA's commuter rail stations are well within their attainable service life. Consequently, the current program devotes only \$2.3 million toward the existing commuter rail stations. This represents less than 1.0% (0.8%) of the total station effort.

### FUNDED PROJECTS: FY01 – FY06

There is one project funded under the current plan. It is the completion of accessibility improvements and other upgrades at Framingham station. This project will have a neutral impact on the Authority's operating budget.

#### Framingham Station

The work at this station will provide for complete accessibility (elevators, pedestrian overpass and curb cuts), as well as repositioning the platform to prevent blockage of Route 126 when trains are in the station.

#### Stations—Commuter Rail: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Framingham Stn	\$7.90	\$5.58	\$2.32	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Program	\$7.90	\$5.58	\$2.32	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

### ANTICIPATED FUTURE NEEDS

*There are no anticipated future needs for the commuter rail station program.*



## STATIONS SILVER LINE

There are 13 Silver Line stations under construction and upon service implementation, the existing Dudley Station will become part of the Silver Line. A total of 10 new stations along Washington Street will open in 2002, with service terminating at the existing Dudley Station in Roxbury. Three additional Silver Line stations along the South Boston Piers Transitway will open in 2003. Silver Line stations are expected to have a useful life of 50 years.

### FUNDED PROJECTS: FY01 - FY06

*Silver Line station construction is funded under System Expansion.*

### ANTICIPATED FUTURE NEEDS

*There are no anticipated future needs for Silver Line station repair or upgrade.*







## STATIONS BUS

The MBTA operates a total of 159 bus and trolley routes, which serve about 9,000 bus stops. In general, the capital components found at bus stops include only bus stop signage. Some also have benches and 259 include shelters. There are several major bus terminals (e.g. Harvard Square, Ruggles), but with the exception of the South Station Transportation Center, these structures are considered part of intermodal subway stations. All bus stations have useful lives of 50 years.

The Authority has devoted \$280,000 towards the bus stations program. This represents less than 1.0% (0.1%) of the total stations effort.



### FUNDED PROJECTS: FY01 – FY06

There is one bus station project. This effort will have a neutral impact on the Authority's operating budget.

#### Bus Shelter Installation

This project involves the installation of 100 bus shelters throughout the urban core of the system.

#### Stations—Bus: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Bus Shelters	\$0.28	\$0.00	\$0.15	\$0.03	\$0.05	\$0.05	\$0.00	\$0.00	\$0.13	\$0.00
<b>Total Program</b>	<b>\$0.28</b>	<b>\$0.00</b>	<b>\$0.15</b>	<b>\$0.03</b>	<b>\$0.05</b>	<b>\$0.05</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.13</b>	<b>\$0.00</b>

### ANTICIPATED FUTURE NEEDS

Two specific projects have been identified as future needs for bus stations.

#### Back Bay Busway Repair

The busway at Back Bay station will require minor repairs.

#### Bus Facility Ruggles Station Pavers

The pavers at Ruggles Station are deteriorating and will need replacement in the future.





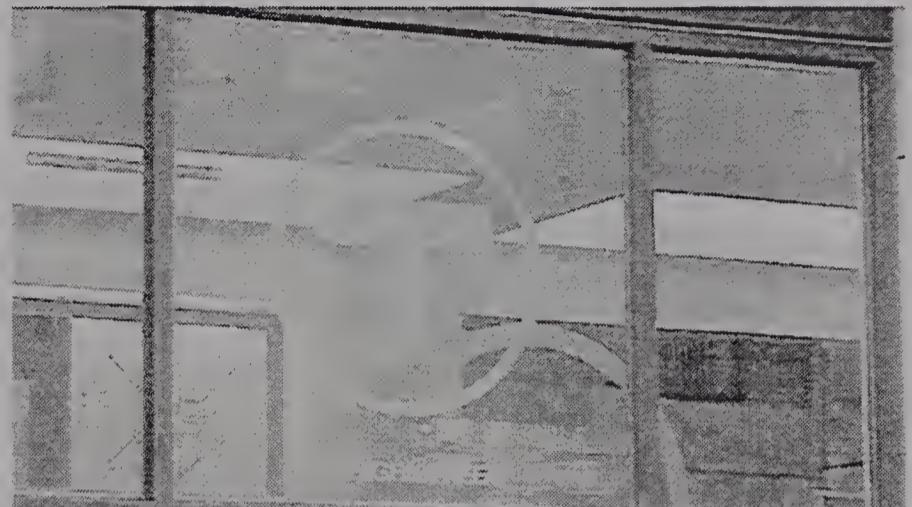
## PROGRAM OVERVIEW

Facilities include administrative buildings, operator's lobbies, ferry terminals, vent buildings, storage buildings, noise walls, tunnels, culverts, retaining walls, parking garages, parking lots, escalators and elevators.

MBTA owned administrative buildings include: 45 High Street, 500 Arborway, Charlestown (Buildings 2 and 3), the Cobble Hill commuter rail operations facility, the Quality Control Facility on Freeport Street, and the police station on Southampton Street. The remaining facilities under this program are located throughout the transit and commuter rail systems. All facilities usually have a useful life of 50 years.

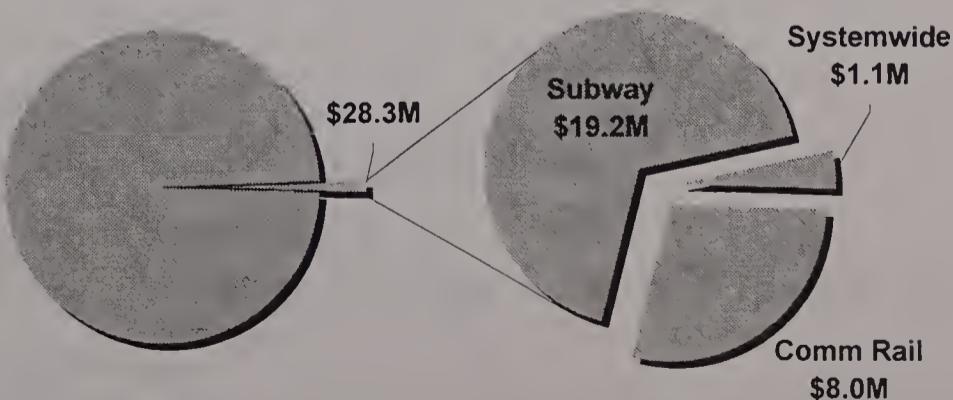
Fencing, which prevents trespassers from gaining access to tracks and fast moving trains, is also included in this section. Fencing has a considerable impact on maintenance costs, particularly on the commuter rail system.

The current program devotes \$28.3 million toward facilities. The six-year facility program represents 1.0% of the total capital investment program spending. This funding is largely devoted towards the construction of new vent facilities along the Red and Blue Lines.



**MBTA Capital  
Improvement  
Program**  
**\$2.91B**

**Funded  
Facilities Program**  
**\$28.3 Million**





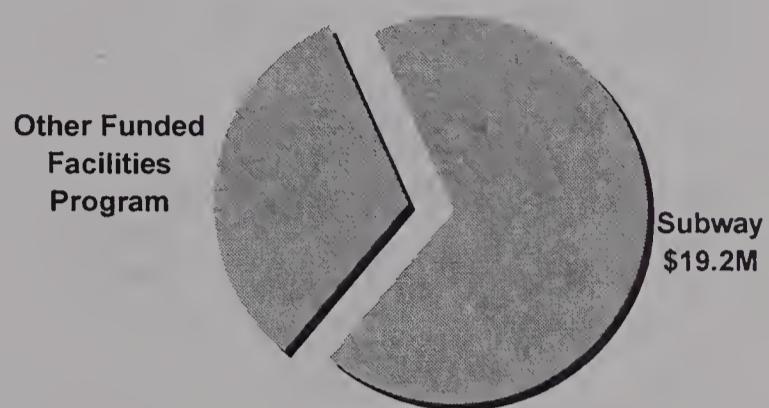


## FACILITIES SUBWAY

Funded Facilities Program = \$28.3 Million

Subway facilities include administrative buildings and operator's lobbies on each of the lines, ventilation structures and other miscellaneous structures.

The current program devotes \$19.2 million toward subway facilities. This represents 67.8% of the total facilities. The majority of this effort is funding for the construction of two new facilities for Red and Blue Line ventilation.



### FUNDED PROJECTS: FY01 - FY06

There are two funded projects under the subway facility program. Both construct new vent buildings to improve ventilation. The projects will have a negative impact on the Authority's operating budget but will improve safety.

#### Blue Line Vent Shaft Construction

This project involves the design and construction of three new Blue Line vent shafts to provide emergency ventilation at Bowdoin, Maverick, and Aquarium. The Aquarium shaft is under construction and part of the budget for the Aquarium Traction Power project. The two remaining facilities are programmed beginning in FY07 and are part of the Blue Line Modernization effort.

#### Red Line Ventilation Improvements—Phase I

The project consists of the design of four (4) ventilation shafts to provide emergency ventilation for the Red Line Subway. Vent shafts are proposed to be located between each of the downtown stations, from Charles/MGH on the north to Broadway on the South. Two of the four facilities are funded for construction under Phase I.

#### Facilities—Subway: FY01 - FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
BL-Vent shaft Const.	\$25.05	\$0.45	\$0.05	\$0.40	\$0.45	\$0.00	\$0.00	\$0.00	\$0.85	\$23.60
RL-Vent. Improv.	\$19.00	\$0.71	\$4.32	\$8.18	\$5.79	\$0.00	\$0.00	\$0.00	\$13.97	\$0.00
<b>Total Program</b>	<b>\$44.05</b>	<b>\$1.16</b>	<b>\$4.37</b>	<b>\$8.58</b>	<b>\$6.24</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$14.82</b>	<b>\$23.60</b>

### ANTICIPATED FUTURE NEEDS

There are three projects identified as future needs for subway facilities.

#### Red Line Ventilation Improvements—Phase II

This would provide construction funding for the remaining two vent shafts designed under the current effort.

#### Chilled Water System Modifications

The project involves the installation of 6 to 8 valves and related piping to main chilled water heaters at 500 Arborway.

#### 45 High Street-HVAC Chiller Replacement

The project involves the installation of a 200-ton rooftop mounted HVAC chiller tied into existing cooling tower system.





## FACILITIES COMMUTER RAIL

Funded Facilities Program = \$28.3 Million

Commuter rail facilities include any structures or facilities at the eleven outlying layover points, five maintenance buildings and five storage buildings throughout the system. It also includes the administrative facility operation center at Cobble Hill.

### Layover Facilities

The Authority has layover facilities at the following locations:

- Rockport
- Newburyport
- Bradford
- Lowell
- Fitchburg
- Needham
- Franklin
- East Junction
- Kingston
- Middleborough
- Worcester

Layover facilities are located at or near the end of commuter lines and are used as nighttime storage locations for train sets as well as points for fueling and performing minor repairs to the rolling stock equipment. The construction of a new layover facility is anticipated to begin in 2001. All layover facilities have a useful life of 50 years.

### Maintenance and Storage Facilities

All maintenance storage facilities have useful lives of 50 years. The following are maintenance facilities: Readville Mechanical, Readville MOW, Abington MOW, Wilmington MOW, and Roland Street MOW.

The following are equipment storage facilities: Lowell, Attleboro, Franklin, Rockport, and Wilmington.

Fencing along the commuter rail is used to control trespassers, protect pedestrians, and MBTA property. It is necessary to keep trespassers from interfering with fast moving trains, and also preventing illegal dumping of trash and contaminated materials.

The current program devotes \$8.0 million toward commuter rail facilities. This represents 28.2% of the total facilities effort.

### **FUNDED PROJECTS: FY01 - FY06**

There is one project in the current plan for commuter rail facilities. It is the construction of a layover facility in Pawtucket to replace the current Attleboro location. This project will have a neutral impact on the MBTA's operating budget.

#### **Pawtucket Layover Facility**

Construction of a commuter rail layover facility in Pawtucket, RI will replace the South Attleboro facility and provide the MBTA with more efficient train set operation. The facility will also better serve the commuter ridership from Providence, RI. RIDOT is providing the federal funds for this effort.



**Facilities—Commuter Rail: FY01 – FY06 Projects (\$ in Millions)**

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Pawtucket Layover Fac	\$8.00	\$0.00	\$2.78	\$3.66	\$1.56	\$0.00	\$0.00	\$0.00	\$5.22	\$0.00
<b>Total Program</b>	<b>\$8.00</b>	<b>\$0.00</b>	<b>\$2.78</b>	<b>\$3.66</b>	<b>\$1.56</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$5.22</b>	<b>\$0.00</b>

**ANTICIPATED FUTURE NEEDS**

The projects listed below have been identified as anticipated future needs for commuter rail facilities.

**Kingston Layover Cable Extension**

The project consists of the extension of the cables at the Kingston layover facility to allow for proper positioning of trainsets on the layover tracks.

**Fitchburg Roundhouse – Demolition**

This project will demolish and remove building materials in the partially collapsed roundhouse at Fitchburg. This will occur following the abatement of asbestos at Fitchburg, which is discussed in the environmental compliance section.



## FACILITIES SYSTEMWIDE

Systemwide facilities include administrative buildings, and other miscellaneous structures owned by the MBTA. These may include inactive structures, noise walls, office buildings or systemwide support facilities. MBTA owned administrative buildings include 45 High Street, 500 Arborway, Charlestown, the commuter rail operations facility at Cobble Hill, the Quality Control Facility on Freeport Street, and the police station on Southampton Street. The MBTA facility program includes the ferry pier at Hingham. Other ferry facilities are leased. Parking lots and garages are also included here, as are elevators and escalators. The MBTA owns approximately 26,200 surface parking spaces and 7,800 garage spaces with a useful life of 50 years. The Authority has 100 elevators and 132 escalators located throughout the system. All elevators and escalators have 20-year useful lives. There are no current funds for the systemwide facilities.



The current program devotes \$1.1 million toward commuter rail facilities. This represents 4.0% of the total facilities effort.

### FUNDED PROJECTS: FY01 – FY06

There is one project scheduled for systemwide facilities. It will have a neutral impact on the Authority's operating budget.

#### Systemwide Safety Upgrade Program

This project funds the upgrade of elevators and escalators throughout the system. This effort will improve the safety of these facilities and reduce maintenance costs.

#### Facilities—Systemwide: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Systemwide Safety Upg.	\$3.34	\$2.21	\$1.12	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Program</b>	<b>\$3.34</b>	<b>\$2.21</b>	<b>\$1.12</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE NEEDS

The following projects have been identified as future needs for systemwide facilities.

### **Hingham Terminal Improvements—Phase I**

This work involves general improvements to the Hingham terminal including covering a portion of the walkway, enhancing the lighting and making the gangway accessible.

### **Elevators and Escalators**

In addition to the ongoing maintenance programs, the replacement of elevators and escalators as they reach their useful service life is anticipated. Escalators, in particular, are required to operate over an extended period of time each day and, in some instances, are exposed to the elements.

### **Escalator Safety Skirt Panels**

The project encompasses the purchase and installation of escalator panel safety skirt devices.

### **Parking Lots and Garages**

Increasing parking capacity over the past 10 years has created a future need for restriping, resurfacing, and surface patching for parking lots. The concrete decks and ramps at parking garages will require future patching.

### **Systemwide Pump Room Rehabilitation Program**

A pump room rehabilitation program is suggested for the future.

### **Systemwide Paving Program**

A program is anticipated to maintain and replace deteriorated pavement for facilities throughout the system.



## FACILITIES

### TUNNELS, WALLS, CULVERTS

Tunnels, walls, and culverts are located throughout the system. Tunnels are mainly on the core subway system and in several locations in the commuter rail network. The rapid transit system operates within 14 miles of tunnels. The light rail system operates within 5 miles of tunnel. Tunnels generally have a useful life of 100 years. The network of retaining walls and culverts is also extensive. There are 767 culverts along the commuter rail and 16 on the subway system. All culverts have a useful life of 50 years. Retaining walls have a useful life of 50 years and are located along the commuter rail and rapid transit systems.

Currently, there are no projects programmed for the Authority's tunnels, walls, and culverts.

### FUNDED PROJECTS: FY01 - FY06

*There are no identifiable projects funded within the current program for tunnels, walls, and culverts. Some work is performed under other improvement projects.*



## ANTICIPATED FUTURE NEEDS

Many subway tunnels throughout the system are experiencing leakage. Overtime, this will lead to the degradation of tunnel concrete. Further deterioration will require extensive removal and replacement of concrete, and long-term damage will require the replacement of the tunnels. The following projects have been identified as being future needs.

### Systemwide Tunnel Repair and Assignment

Tunnel repairs such as grouting of the most severe leaks and repair of loose concrete is anticipated. A feasibility study should determine the estimated cost of comprehensive drainage improvements to reduce water migration around the tunnel. A complete assessment report should then be developed based on more detailed inspection and evaluation of the leaks and concrete deterioration.

### Commuter Rail Culverts and Retaining Wall Repair Program

A culvert and retaining wall program is suggested to inspect these structures using a standardized method for consolidating different sizes and materials into simple condition rating, which will help establish priorities for repair. Approximately 7% of the existing culverts and retaining walls are in need of replacement.

### Back Bay Station Tunnel Improvements

Ventilation, radio communication, and egress emergency improvements are anticipated in the Back Bay tunnel. This effort will lead to an improvement in the tunnel system at Back Bay.

### Needham Heights Retaining Wall Rehabilitation

The retaining wall behind the mini-station platform at Needham Heights station is beyond its useful life. Replacement should be scheduled.



## PROGRAM OVERVIEW

The MBTA maintains 458 bridges, including 325 railroad bridges, 58 transit bridges, and 75 highway bridges (carrying vehicles over track and rights-of-way). Railroad and transit bridges typically have a useful life of 70 years, while highway bridges have a useful life of 50 years. Both railroad and transit bridges have the same maintenance schedule. Renewal of bridge deck replacement occurs after 50 years of use. Bridge deck waterproofing is replaced after 40 years, and steel is repainted after 30 years. Highway bridges, however, have a different maintenance schedule. Bridge deck replacements occur after 30 years of use and steel is repainted every 15 years.

In an effort to upgrade and maintain these bridges, the Authority has developed a Bridge Management Program based on an ongoing bridge rating system. A bridge inspection program was tailored to ensure that all the bridges received adequate attention. The frequency and type of inspection for each structure depends on the structural condition of the bridge, such as its speed and load restrictions. The MBTA maintains a database that includes information about all bridges, including projected cost of future rehabilitation. The database also includes information on inspections and complete structural information such as description, dimensions, condition appraisal, and load rating information. Condition ratings in the MBTA Bridge Management System database provide information to help determine when bridge elements are in need of replacement or repair. The ratings calculations are performed every 5 years for each bridge.

The current program devotes \$15.6 million toward bridges and viaducts. The bridge and viaduct program represents less than 1.0% (0.5%) of the total capital investment program.



## FUNDED PROJECTS: FY01 – FY06

There are eight active bridge and viaduct projects. The majority of bridge reconstruction projects entail complete structure replacement, most of which are nearing completion. These efforts will have a neutral impact on the operations budget.

### Beach Street Bridge (Revere)

The project consists of the replacement of superstructures and abutment rehabilitation as well as the reinstallation of necessary utilities, drainage repair and installation of approach slabs. This effort will enhance public safety.

### Adams (Milton) and Medway Street Bridges (Dorchester)

The project involves the replacement of superstructures for the two bridges, catenary improvements, reduction of spans (from 3 to 1) and rehabilitation of bridge abutments as necessary. This will enhance public safety and trolley services on the Ashmont/Mattapan Highspeed line.

### Canton Viaduct

This project is in its final completion stage. The purpose of this work to completely perform restoration and structural modifications to handle the existing service trains and the new high speed AMTRAK trains.

### Bridge Management Engineering Program (Local)

The program includes contracts to inspect and rate highway, transit, and railroad bridges to meet the National Bridge Inspection Standard (NBIS) set by the Federal Highway Administration (FHA). It also includes design contracts for 4 bridge projects (Morrissey/Freeport/Savin Hill, Washington Street, West Street, Main Street). Also completed was the inventory of 58 pedestrian bridges and 46 utility bridges over the MBTA transit and commuter rail bridges.

### Bridge Management Engineering Program (Federal)

The program involves the management, inspection, rating and design for rehabilitation of the Authority's highway, transit and commuter rail bridges (\$800K). This also includes the complete design for rehabilitation of Herrick Road in Newton (\$349K) and Cypress Bridge in Brookline (\$349K).

### Cypress Bridge

This effort consists of the replacement of superstructures, rehabilitating of the bridge abutments and the installation of new catenary wires for both bridges, including replacement of utility lines (water, gas, telephone, etc.). This will enhance public safety.

### Herrick Bridge

This effort consists of the replacement of superstructures, rehabilitating of the bridge abutments and the installation of new catenary wires for both bridges, including replacement of utility lines (water, gas, telephone, etc.). This will enhance public safety.

### Dorchester Line Bridge Reconstruction

The project involves the completion of the redesign and replacement of the Morrissey Blvd, Freeport and Savin Hill bridges with a single span, ballasted deck, welded steel plate girder type bridge.

#### Bridges/Viaducts Program: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Beach St. Revere	\$2.59	\$1.58	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Adams/Medway	\$5.42	\$5.16	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Canton Viaduct	\$7.70	\$6.65	\$1.71	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
BMEP (Local)	\$23.10	\$18.17	\$2.93	\$2.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2.00	\$0.00
BMEP (FED)	\$1.50	\$0.32	\$0.46	\$0.26	\$0.26	\$0.11	\$0.08	\$0.00	\$0.72	\$0.00
Cypress Street	\$2.50	\$0.00	\$0.00	\$0.60	\$1.75	\$0.15	\$0.00	\$0.00	\$2.50	\$0.00
Herrick St.	\$2.50	\$0.00	\$0.00	\$0.60	\$1.75	\$0.15	\$0.00	\$0.00	\$2.50	\$0.00
Dorchester Line Rehab	\$2.50	\$0.00	\$0.00	\$0.80	\$1.50	\$0.20	\$0.00	\$0.00	\$2.50	\$0.00
<b>Total Program</b>	<b>\$47.81</b>	<b>\$31.88</b>	<b>\$5.35</b>	<b>\$4.26</b>	<b>\$5.26</b>	<b>\$0.61</b>	<b>\$0.08</b>	<b>\$0.00</b>	<b>\$10.22</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE NEEDS

The average age of Authority maintained bridges is 70 years. A long-term plan is being developed to upgrade the bridges, which would be more cost effective than continual maintenance and also reduce the risk of disruption in both transit service and highway traffic due to repairs. A program of regular replacements and upgrades throughout the system will decrease risk of disruptions in both transit service and highway traffic resulting from maintenance activities and emergency repairs.



### Columbia Road Signal Interlocking System

The project involves redesigning and installation of a signal interlocking system at milepost 224 to facilitate reconstruction of the Dorchester Commuter Rail line (Columbia Road, Massachusetts Avenue, and Quincy Street bridges). This will allow single-track operation for service to continue during reconstruction of the Dorchester line.

### Dorchester Line Bridge Reconstruction

The project involves the completion of the redesign and replacement of the Columbia Road, Massachusetts Avenue, and Quincy Street bridges with a single span, ballasted deck, welded steel plate girder type bridge. Construction will follow the interlocking project above.

### Beacon and Roger Bridges (Newton)

The project involves the replacement of the superstructures for the two bridges, catenary improvements, rehabilitation of bridge abutments, reinstallation of necessary utilities, drainage repairs and installation of approach slabs.

### Fort Point Channel Bridge (MHD)

This project involves the final project elements related to reconstruction of the Fort Point Channel Bridge, a joint project with MHD.

### Merrimack River Bridge Redesign

The project involves the design for rehabilitation of Merrimack River Bridge, reducing it from 2 spans and making it a single span bridge.

### Pedestrian/Utility Bridges Inspection

This project involves the inspection of the 58 pedestrian and 46 utility bridges over the MBTA's transit and commuter rail systems to determine levels of rehabilitation and reconstruction that each bridge needs.

### Highway Bridges

There are eight bridges out of 76 highway bridges that are approximately 70 years of age. Throughout the system, there are several bridges that are anticipated for repair or replacement because of their age and condition.

### Railroad Bridges

Fifteen MBTA railroad bridges represent the priority in needs for future replacement/rehabilitation in order to meet the required EAT Cooper load rating (the amount of weight a bridge can hold) and improve the long-term soundness of the structure. These include Washington Street, West Street, East Street, Talbot and Woodrow Avenue, Main Street in Concord, and the Merrimack River Bridge.

### Transit Bridges

Out of the 59 transit bridges, one anticipated project is Shawmut Junction on Dorchester.





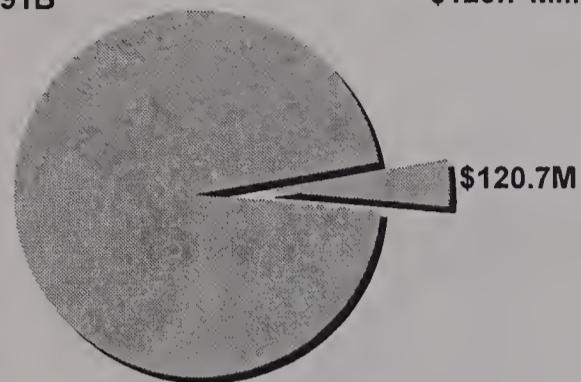
## PROGRAM OVERVIEW

The MBTA's fare collection system differs by mode and includes station-based, vehicle-based and system control equipment. On the subway/rapid transit system, fare collection equipment includes 475 turnstiles at 90 barrier fare collection locations. Fare collection booths and exit gates at rapid transit stations are also considered to be part of the fare collection system as well as on-board conductors, who perform fare collection on the commuter rail system. There is no associated capital equipment.



MBTA Capital Improvement Program  
\$2.91B

Funded Fare Equipment Program  
\$120.7 Million



The existing fare collection equipment is 25 to 30 years old. Continued upkeep of the existing system is increasingly expensive due to its aging and the cost of replacement of parts. The Authority envisions moving towards a new automated fare collection system in the future. An automated system would provide greater system security, improve passenger convenience and reduce fare evasion.

The Revenue Department also maintains and operates control, counting, and security equipment through a central computer system at a central facility. Wayside equipment that is used has a 17-year useful life. Associated software is also maintained.

The current program devotes \$120.7 million toward the installation of a new Automatic Fare Collection system. Fare equipment represents 4.2% of the total capital investment program.

## FUNDED PROJECTS: FY01 – FY06

The AFC will have an annual savings of over \$4.5 million and have a positive impact on the operating budget.

### Fare Equipment Upgrades

The purpose of this effort is to replace deteriorating fare equipment. This will allow the Authority to improve its fare collection efforts.

### Automatic Fare Collection (AFC)

The complete AFC program would replace tokens and the existing collection system with ticket machines, customer service agents and electronic turnstiles. This project will aid the Authority in its efforts to transition to a tokenless system that will enhance customer service and maximize revenue. The program also includes the purchase of ticket vending machines, an integrated central computer and a variety of communications equipment.

#### Fare Equipment: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Systemwide Fare Equip.	\$8.49	\$7.76	\$0.48	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.25	\$0.00
AFC	\$120.00	\$0.00	\$5.92	\$29.09	\$35.87	\$36.13	\$13.00	\$0.00	\$114.09	\$0.00
<b>Total Program</b>	<b>\$128.49</b>	<b>\$7.76</b>	<b>\$6.40</b>	<b>\$29.34</b>	<b>\$35.87</b>	<b>\$36.13</b>	<b>\$13.00</b>	<b>\$0.00</b>	<b>\$114.34</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE NEEDS

*There are no anticipated future needs for fare equipment.*



## PROGRAM OVERVIEW

In response to the Americans with Disabilities Act (ADA) of 1990, the Authority developed an approved Key Station Plan as the initial step in carrying out its obligations under the act. The ADA, a Title II-Public Services Act, prohibits public transportation systems from discriminating against persons with disabilities. Title II includes the requirements for key stations to be made accessible. The Department of Transportation established specific requirements for developing systemwide program accessibility, including work with the community of people who have disabilities to determine key stations.

Since 1990, the Authority has rapidly become a leader in efforts to achieve station accessibility. The MBTA has been working to bring its 80 identified key stations into compliance. To date 50 key stations have been brought into compliance and 119 MBTA stations (including 69 “non-key” stations) are now accessible. In 1998, the Authority signed a memorandum of agreement with FTA, committing to final compliance dates for the remaining 30 key stations.

The current plan programs \$174.0 million toward accessibility. This represents 6.0% of the total capital investment program. The majority of accessibility funding is devoted towards the Light Rail Accessibility Program (LRAP) for the Green Line. Another significant project involves accessibility improvements at the Charles/MGH Red Line station.



### FUNDED PROJECTS: FY01 – FY06

Currently, there are ten funded projects under accessibility, all of which will have a neutral impact on the Authority's operating budget.

#### RIDE Computer System/Study

This effort funds the installation of an improved scheduling system for RIDE services to improve the program's ability to better serve its passengers.

#### Orange Line Haymarket Station Accessibility Improvements

The project involves the continued demolition and reconstruction of the Haymarket station in order for the station to meet ADA access improvement requirements.

#### Green Line Interim Accessibility Improvements

This program constructs interim accessibility (temporary platforms and lifts) at several Green Line stations. This enables the MBTA to service passengers with handicaps and disabilities in the period leading up to full line accessibility.

#### Orange Line Chinatown Southbound Access

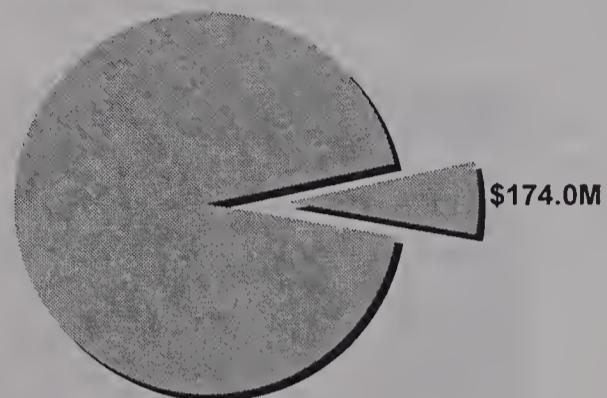
To meet ADA access improvements, the Authority will expand the southbound platform level lobby at Chinatown to incorporate an elevator. At grade level, the elevator will be integrated with Boylston Street façade of the Millennium Place Development.

#### Systemwide Key Station Improvements

This funding will help bring remaining stations into compliance with the ADA and includes Central Square, Harvard Square, and Jackson Square, which need detectable warnings added to the platform edge.

**MBTA Capital  
Improvement  
Program  
\$2.91B**

**Funded  
Accessibility Program  
\$174.0 Million**



### Fairmont Station Accessibility—Construction

The project will include the construction of two new mini-high level platforms with canopies, barrier free-access, addition of ramps to the platforms, an accessible path of travel, and improved signage.

### Red Line Charles/MGH Station Reconstruction

As part of the Key Station plan, the Authority has committed to completing improvements at Charles/MGH by 2003. The scope of improvements will include barrier free access, the addition of elevators and/or ramps, an accessible path of travel, improved signage and barrier-free gates. A contribution by Partners/MGH is expected.



### Green Line Light Rail Accessibility Program (LRAP)

In compliance with the ADA, the MBTA will focus on the improvement of 22 surface stations and 7 Central Subway stations to make light rail stations accessible possible. All surface stations must be complete by 2001. Complex subway sections have been granted extensions up to 2005.

### Orange Line Malden Station Accessibility Design

This project will consist of design for accessibility improvements at Malden Center by 2003. The improvements will be performed at both the Orange Line and Commuter Rail stations and will include barrier free access, the addition of elevators and/or ramps, an accessible path of travel, and improved signage.

### FY01-FY07 Accessibility Projects

This effort is a set aside item for anticipated key station efforts such as those listed as potential future efforts.

#### Accessibility: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
RIDE Comp Study	\$1.42	\$1.01	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Haymarket Statn Access	\$15.47	\$13.46	\$2.02	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Syswid Key Stn Improv	\$1.75	\$1.16	\$0.28	\$0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.31	\$0.00
GL-Interim Access	\$2.85	\$2.11	\$0.34	\$0.40	\$0.00	\$0.00	\$0.00	\$0.00	\$0.40	\$0.00
OL-Chinatown Elevator	\$4.79	\$1.44	\$1.05	\$2.30	\$0.00	\$0.00	\$0.00	\$0.00	\$2.30	\$0.00
Fairmont Stn	\$6.40	\$0.00	\$0.20	\$3.10	\$2.10	\$1.00	\$0.00	\$0.00	\$6.20	\$0.00
RL-Charles/MGH Statn	\$27.00	\$0.00	\$1.09	\$8.04	\$12.15	\$5.73	\$0.00	\$0.00	\$25.91	\$0.00
Light Rail Acc Pgm (LRAP)	\$131.20	\$8.26	\$18.59	\$42.93	\$31.90	\$20.72	\$8.79	\$0.00	\$104.35	\$0.00
OL-Malden Stn	\$6.20	\$0.00	\$0.36	\$1.14	\$3.48	\$1.06	\$0.16	\$0.00	\$5.84	\$0.00
Misc ADA Projects	\$7.00	\$0.00	\$0.40	\$1.75	\$1.10	\$0.50	\$0.50	\$0.50	\$4.35	\$0.00
<b>Total Program</b>	<b>\$204.08</b>	<b>\$27.43</b>	<b>\$24.32</b>	<b>\$59.97</b>	<b>\$50.73</b>	<b>\$29.02</b>	<b>\$9.45</b>	<b>\$0.50</b>	<b>\$149.66</b>	<b>\$0.00</b>

### POTENTIAL FUTURE EFFORTS

The following projects have been identified as potential future efforts under the accessibility program.

#### Replacement LED Signage

This effort will consist of the installation or replacement of LED signage for ADA compatibility at 75 passenger stations.

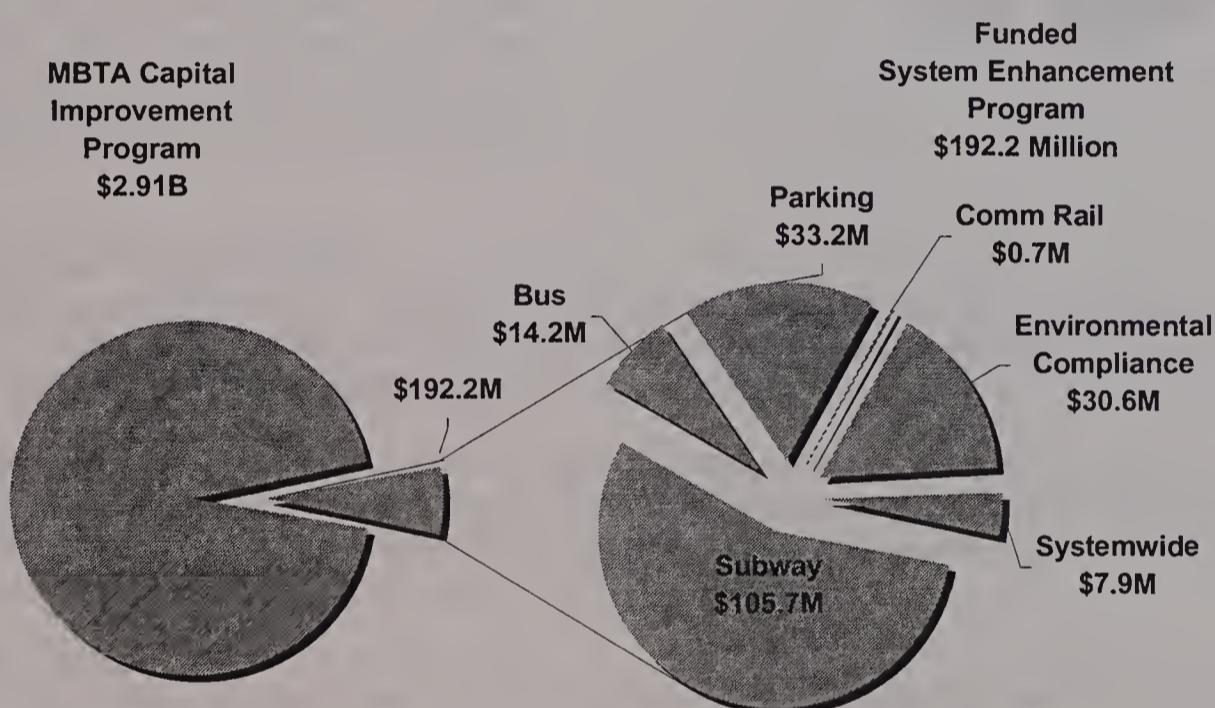
#### Malden Station Accessibility—Construction

The project will fund construction of barrier free access, the addition of elevators and/or ramps, an accessible path of travel, improved signage, barrier-free gates and accessible curb ramps and parking.



## PROGRAM OVERVIEW

System enhancement includes projects that enhance service for existing riders and will attract more riders to the system. The most significant effort under the enhancement program is the reconstruction of the Green and Orange Line stations at North Station. This effort will provide a cross-platform Orange/Green Line transfer and offer improved connections to the commuter rail system. Two additional significant elements of the MBTA's enhancement efforts are parking expansion and environmental compliance. Parking expansion adds more capacity to existing lots in order to attract and better serve more commuters. Environmental compliance enhances the safety and well being of both MBTA customers and employees. This section also covers the evaluation of other efforts, which may lead to implementation or application of new technologies to enhance MBTA service.



The current plan programs \$192.2 million toward the system enhancement efforts. This represents 6.6% of the total capital investment program. The majority of this program is devoted to the rehabilitation of North Station and the expansion of existing parking facilities throughout the system.





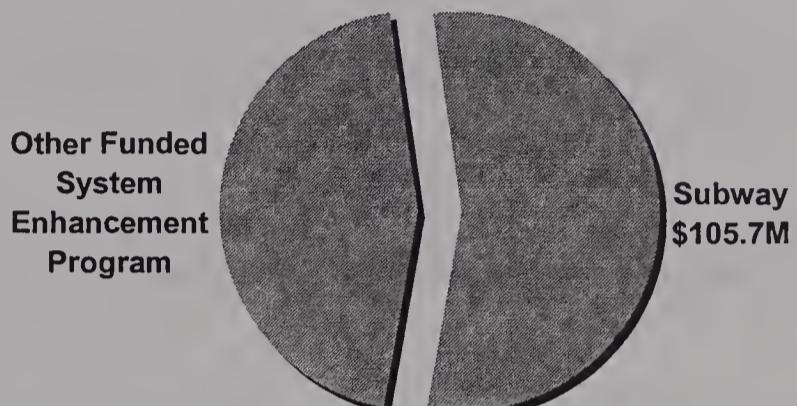
## SYSTEM ENHANCEMENT SUBWAY

The current plan programs \$105.7 million toward enhancement of the subway system. This represents 55.0% of the total system enhancement effort. The majority of this effort is devoted towards North Station Transportation Center, serving the Orange and Green Lines. The useful life of stations can be found under the Station section of this document.

### FUNDED PROJECTS: FY01 - FY06

Currently, there are three funded projects underway for subway system enhancement. One funds the construction of an enhanced Green/Orange transfer station at North Station, one is a project study along the Green Line, and the final is a signage effort. These projects will have a positive impact on the Authority's operating budget.

Funded System Enhancement Program = \$192.2 Million



#### Green Line Operations Improvement

The purpose of this study is to evaluate the capacity of the central subway portion of the Green Line. It will accomplish this through an evaluation of existing conditions, as well as by devising future operating scenarios. Scenarios will be tested against a simulated system to establish future potential capacity.

#### Green and Orange Lines North Station Transportation Center— Phases III & IV

This represents the final phases of the North Station project including systemwide signals, track and construction of the track section under Causeway. Once completed, the North Station Transportation Center will be able to offer easier transfers between the Green Line, Orange Line and commuter rail.

#### LED Signage Upgrade

This will fund the installation of system and neighborhood signage for 25 of the most heavily used stations.

#### System Enhancement—Subway: FY01 - FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
GL-Imp Study	\$0.35	\$0.10	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
N. Stn Trans. Ctr-Ph. III & IV	\$236.30	\$131.84	\$20.14	\$33.41	\$37.46	\$13.44	\$0.00	\$0.00	\$84.31	\$0.00
LED Signage	\$0.95	\$0.00	\$0.00	\$0.00	\$0.10	\$0.85	\$0.00	\$0.00	\$0.95	\$0.00
<b>Total Program</b>	<b>\$237.60</b>	<b>\$131.94</b>	<b>\$20.39</b>	<b>\$33.41</b>	<b>\$37.56</b>	<b>\$14.29</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$85.26</b>	<b>\$0.00</b>

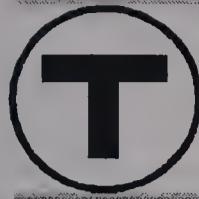
#### ANTICIPATED FUTURE EFFORTS

There is one anticipated enhancement project for subway system enhancement.

##### Green Line Auto Vehicle Identifier (AVI)

This would add AVI technology to Green Line vehicles and tie into the OCC.





## SYSTEM ENHANCEMENT COMMUTER RAIL

The current plan programs \$710,000 toward the enhancement of the commuter rail system. This represents less than 1.0% (0.4%) of the total system enhancement effort.

### FUNDED PROJECTS: FY01 – FY06

There are currently two projects funded under commuter rail system enhancement. Both projects will have a neutral impact on the Authority's operating budget.

#### Four Quadrant Gate Study

The Four-Quadrant Gate is a safety enhancement project, which involves the installation of demonstration gates in Abington. The demonstration project is also evaluating new vehicle precision technology (which detects vehicle location within the crossing) for possible application on other lines.

#### Attleboro Outbound Platform

In 1989, the MBTA constructed a temporary platform on top of Track 3 at Attleboro Station. This temporary platform was installed to make Track 1 fully accessible to commuters. However, it effectively removed Track 3 from service, which must now be restored to accommodate Amtrak's high-speed Acela service.

#### System Enhancement—Commuter Rail: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Four Quad Gates Study	\$0.50	\$0.39	\$0.11	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Attleboro Outbnd Pltfrm	\$1.85	\$1.25	\$0.60	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Program</b>	<b>\$2.35</b>	<b>\$1.64</b>	<b>\$0.71</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE EFFORTS

*There are no anticipated future efforts identified for commuter rail system enhancement.*





## SYSTEM ENHANCEMENT BUS

The current plan programs \$14.2 million toward bus system enhancement. This represents 7.4% of the system enhancement effort.

### FUNDED PROJECTS: FY01 - FY06

There are four funded projects related to bus system enhancement. One involves the retrofit of existing buses with "Smart Bus" technology, one is a project study, one is the completion of the construction at the South Station Transportation Center, and one is the installation of infrastructure for Arborway replacement service. These efforts will have a neutral impact on the Authority's operating budget.



#### "Smart Bus" Technology Enhancement

This project would allow the Authority to outfit 95 buses with "Smart Bus" technology, to provide automated visual and audio announcements to the ridership. This technology provides a more effective means of controlling bus movements and communicating with the riding public.

#### Bus Rapid Transit Development Study

This effort supports development of bus rapid transit system systemwide.

#### South Station Transportation Center ITS Improvements

This effort supports the installation of information kiosk(s) within South Station concourse.

#### Arbway Line Infrastructure Improvements

This effort would make infrastructure improvements to support bus service improvements along the Arborway corridor.

#### System Enhancement— Bus: FY01 - FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Smart Buses	\$2.00	\$0.00	\$0.50	\$1.50	\$0.00	\$0.00	\$0.00	\$0.00	\$1.50	\$0.00
S. Stn Ctr West Link	\$2.46	\$0.34	\$0.08	\$2.04	\$0.00	\$0.00	\$0.00	\$0.00	\$2.04	\$0.00
Arbway Improv	\$10.00	\$0.00	\$0.00	\$2.00	\$6.00	\$2.00	\$0.00	\$0.00	\$10.00	\$0.00
BRTD	\$0.05	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.03	\$0.04	\$0.00
<b>Total Program</b>	<b>\$14.51</b>	<b>\$0.34</b>	<b>\$0.58</b>	<b>\$5.54</b>	<b>\$6.00</b>	<b>\$2.00</b>	<b>\$0.00</b>	<b>\$0.03</b>	<b>\$13.58</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE EFFORTS

There is one project related to bus system enhancement.

#### Bus GPS/Dispatch System

This would equip buses with GPS devices to pinpoint their location and tie the information back to the OCC. This, combined with improved bus system communications, would greater improve bus dispatch capabilities.



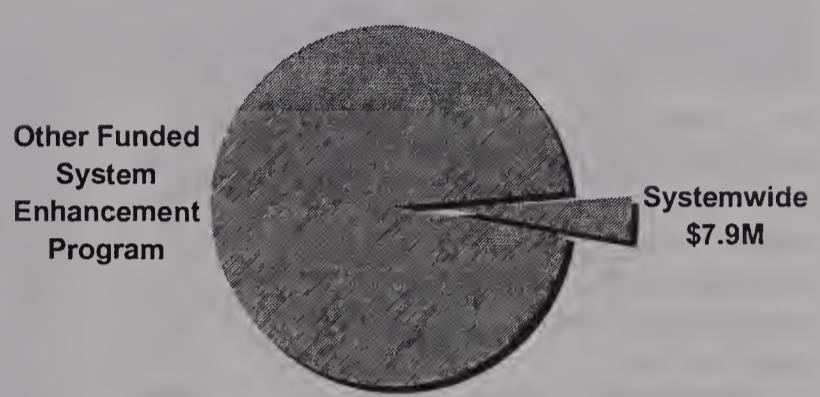


## SYSTEM ENHANCEMENT SYSTEMWIDE

Funded System Enhancement Program = \$192.2 Million

This section represents enhancement efforts that affect the entire system. It also includes the evaluation of new technologies to enhance systemwide services.

The current plan programs \$7.9 million towards systemwide enhancement. This represents 4.1% of the system enhancement effort.



### FUNDING PROJECTS: FY01 - FY06

There are a total of nine projects under systemwide enhancement. These efforts will have no impact on the Authority's operating budget.

#### PROTECT Preliminary Engineering

This project involves research conducted by both the U.S. Department of Energy (DOE) and the Federal Transportation Administration (FTA). The Program for Response and Options and Technology Enhancements (PROTECT) is a research and development program to address the threat of chemical and biological attacks on subways and other critical infrastructure.

#### Transit System Security

This project constructs police kiosks and funds other safety improvements. This will allow the Authority to continue its efforts in providing safety for passengers as well as preventing criminal activity on MBTA property.

#### Pigeon Control Safety Program

The purpose of this effort is to safely discourage increasing pigeon populations at MBTA stations.

#### Passenger Security — Virtual Reality

The purpose of this effort is to enhance the effectiveness of transit security personnel in dealing with real-time, life threatening situations. The VR system will create realistic simulations of transit environments to aid the capability of security officials.

#### Bicycle Facilities and Enhancement Projects Program

This program involves the procurement of bicycle racks for installation throughout the MBTA system based on demonstrated need. This program would also provide monies to accomplish other enhancement initiatives related to bicycle accessibility.

#### Grade Crossing Program

The objective of this project is to improve safety at highway-rail transit grade crossings by the implementation of several safety enhancements that incorporate advanced signal/warning systems and gate technologies.

#### Systemwide Revive and Guide Program

This effort provides new lightning, painting, signage, and other similar elements systemwide and at Downtown Crossing, Chinatown, Science Park, Orient Heights, and Broadway stations.

#### MBTA Art Program

This effort provides a resource for the public to utilize and enjoy. The Arts program includes an art restoration needs study, restoration work, support costs for the Adopt the Arts program, a station panel program, an art bench program as well as new acquisitions for Quincy Adams, Airport Station, and the 3 Transitway Stations.

### Systemwide System Enhancements

This effort supports various system enhancement efforts throughout the Authority.

#### System Enhancement—Systemwide: FY01 – FY06 (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
PROTECT Prelimin. Eng	\$0.14	\$0.00	\$0.09	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Tran System Security	\$0.32	\$0.15	\$0.17	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Bike Enhancement Pgm	\$0.05	\$0.00	\$0.01	\$0.04	\$0.00	\$0.00	\$0.00	\$0.00	\$0.04	\$0.00
Pigeon Safety Program	\$0.25	\$0.00	\$0.25	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Grade Crossing Pgm	\$0.38	\$0.00	\$0.30	\$0.08	\$0.00	\$0.00	\$0.00	\$0.00	\$0.08	\$0.00
Passenger Security/VR	\$0.10	\$0.00	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Systemwide Revive/Guide	\$3.00	\$0.00	\$0.60	\$2.00	\$0.40	\$0.00	\$0.00	\$0.00	\$2.40	\$0.00
MBTA Art Pgm	\$1.20	\$0.13	\$0.47	\$0.30	\$0.30	\$0.00	\$0.00	\$0.00	\$0.60	\$0.00
Systemwide Enhancements	\$3.17	\$0.00	\$0.00	\$0.44	\$0.00	\$0.57	\$0.90	\$0.90	\$2.81	\$0.36
<b>Total Program</b>	<b>\$8.61</b>	<b>\$0.28</b>	<b>\$1.98</b>	<b>\$2.86</b>	<b>\$0.70</b>	<b>\$0.57</b>	<b>\$0.90</b>	<b>\$0.90</b>	<b>\$5.93</b>	<b>\$0.36</b>

### ANTICIPATED FUTURE EFFORTS

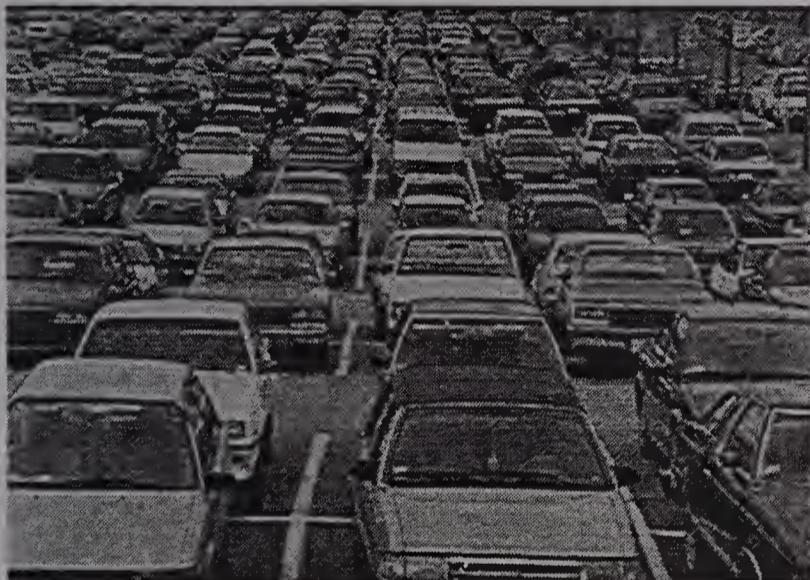
*There are no anticipated systemwide enhancement efforts.*



## SYSTEM ENHANCEMENT PARKING

MBTA parking facilities include both open surface parking lots and enclosed parking garages. There are approximately 39,000 (15,626 rapid transit/light rail, 23,355 commuter rail) parking spaces throughout the system.

In 1991, as part of commitments made under the Central Artery and State Implementation Plan (SIP), the state committed to building 20,000 new spaces. With the MBTA's contribution of 16,333 spaces to date, this commitment is nearly complete. Several additional programmed MBTA projects will contribute the balance necessary to meet the commitment goal.



### Canton Junction Commuter Rail Station

This represents the final project elements related to parking and station improvements at the Canton Junction commuter rail station.

### Lakeville/Middleborough and Halifax Commuter Rail Stations

The project will consist of the construction of 300 additional spaces at the Lakeville/Middleborough Station and 110 additional spaces at the Halifax station.

### Walpole Commuter Rail Station

This project will provide 300 parking spaces for Walpole station, platform extension, the construction of mini-high platform and making the station accessible to all passengers.

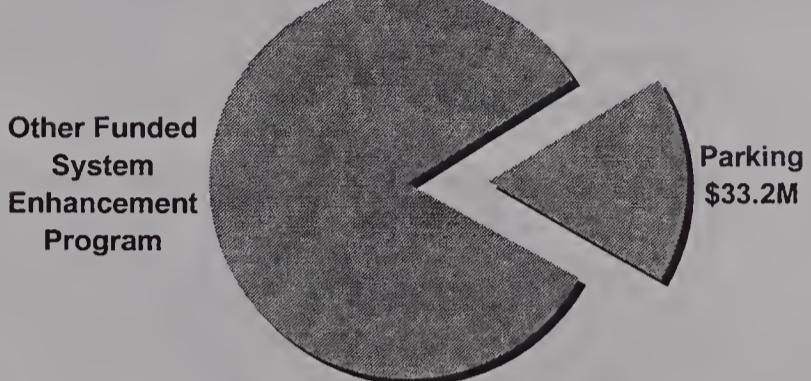
### System Park and Ride Support

This grant funds support activities necessary to initiate and advance parking expansion projects. Activities include appraisals and conceptual designs.

### North Woburn Regional Transportation Center

The project will consist of the construction of a new commuter rail station and a 2,400-space parking lot in North Woburn. The MBTA is cooperating with Massport and MHD on this effort.

Funded System Enhancement Program = \$192.2 Million



The current plan devotes \$33.2 million toward parking enhancement, which represents 17.3% of the total system enhancement effort. The most significant effort is the construction of a new station with over 2,400 spaces in Woburn. The majority of other projects are also at commuter rail stations. The useful life of parking lots can be found under the Systemwide Facilities section of this document.

### FUNDED PROJECTS: FY01 - FY06

There are currently eight parking projects in various stages. Together, they would provide about 3,700 spaces for MBTA commuters. These projects will have a neutral impact on the Authority's operating budget.

### **Wilmington Station and Parking**

The project consists of the design and construction of a new station, a 225 space and commuter parking lot, accessibility improvements and mini-high platforms, track and signal work, aesthetic improvements to the MBTA's maintenance of way facility and the construction of 800 feet of roadway adjacent to the station.

### **Hamilton/Wenham Commuter Rail Station**

The project includes the addition of 200 parking spaces and the reconstruction of the platform and mini-high platform on the eastern side of the track. The existing platforms on the west side will be demolished. This will augment parking capacities, and improve traffic flow in the area.

### **Gloucester Intermodal Commuter Rail Station Design and Improvements**

The project is an effort to revitalize Gloucester Depot and the surrounding area. It will consist of general station improvements, including expanded parking from 33 to 160 spaces, establishing a bus layover area, improving accessibility, and application of Intelligent Transit System (ITS) support. This effort will also fund design. The Authority would provide up to \$700,000 in matching funds.

#### **System Enhancement—Parking: FY01 – FY06 Projects (\$ in Millions)**

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Canton Junction	\$7.48	\$7.02	\$0.29	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Lakeville/Midlboro/Halifax	\$3.00	\$0.30	\$1.85	\$0.84	\$0.00	\$0.00	\$0.00	\$0.00	\$0.84	\$0.00
Walpole Stn	\$3.00	\$0.00	\$0.00	\$3.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3.00	\$0.00
System Park/Ride Support	\$11.35	\$8.68	\$1.77	\$0.90	\$0.00	\$0.00	\$0.00	\$0.00	\$0.90	\$0.00
N. Woburn RTC	\$15.88	\$3.04	\$10.91	\$1.93	\$0.00	\$0.00	\$0.00	\$0.00	\$1.93	\$0.00
Wilmington Stn	\$10.30	\$4.81	\$3.01	\$2.48	\$0.00	\$0.00	\$0.00	\$0.00	\$2.48	\$0.00
Hamilton/Wenham Stn	\$2.64	\$0.01	\$1.23	\$1.25	\$0.15	\$0.00	\$0.00	\$0.00	\$1.40	\$0.00
Gloucester Intermodel Fac.	\$3.63	\$0.07	\$1.31	\$1.39	\$0.86	\$0.00	\$0.00	\$0.00	\$2.25	\$0.00
<b>Total Program</b>	<b>\$57.29</b>	<b>\$23.94</b>	<b>\$20.36</b>	<b>\$11.80</b>	<b>\$1.01</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$12.80</b>	<b>\$0.00</b>

### **ANTICIPATED FUTURE EFFORTS**

The following projects have been identified as future efforts for parking enhancement.

#### **Red Line Quincy Adams Parking**

An addition to the Quincy Adams Station parking garage was designed (to 90%) in the early 1990's.

#### **Rockport Commuter Rail Station Improvements**

Design and construction of additional spaces at Rockport is anticipated.

#### **Ayer Commuter Rail Station Improvements**

Design and construction of additional spaces at Ayer is anticipated.

#### **Whitman Commuter Rail Station**

This effort, which includes acquisition, involves the development of a 300-space parking facility at Whitman.

#### **Natick Center Commuter Rail Station**

The Natick Center garage is proposed to be a 563-space facility near the commuter rail station. The town of Natick would provide the land for this garage and in return would be given 140 spaces on the first floor. The remaining 423 spaces will be for MBTA commuters.



## SYSTEM ENHANCEMENT ENVIRONMENTAL COMPLIANCE

The MBTA understands the importance of performing in a safe, healthy environment. Therefore, to ensure the safety of the environment, the Authority's Environmental Management Department conducts regular comprehensive environmental audits of facilities to identify non-compliance issues and to develop strategies and schedules for bringing the facilities into compliance. Standard operating procedures for environmental issues are established for all facilities. Areas of oversight include underground storage tanks, handling and disposal of hazardous materials, stormwater and wastewater management, air quality issues and any other regulated environmental matter.

The environmental compliance program also includes the identification, design and implementation of environmental mitigation measures, as necessary and appropriate, throughout the MBTA system. The Authority also responds to environmental clean up requirements, using Licensed Site Professionals as required under state regulations. Finally, the Authority has a noise mitigation program.

As shown in the graph above, the current plan programs \$30.6 million towards environmental compliance. This represents 15.9% of total system enhancement expenditures.

### FUNDED PROJECTS: FY01 - FY06

There are twelve funded projects under the environmental compliance program. These projects will have a neutral impact on the Authority's operating budget.

#### Gallagher Terminal Remediation

This funding represents the MBTA's share of potential remediation costs related to the Lowell Regional Transit Authority's expansion of parking at Gallagher Terminal in Lowell.

#### Bus Operations Cleaning Tank Replacement

The project encompasses the replacement of the Everett repair facility's steam cleaning tanks for engine and transmission parts. This effort will allow for more effective operations and will meet environmental regulations.

#### Orange Line Wellington Noise Wall— Medford

The project involves the design and construction of a noise wall for residences along Craddock Avenue in Medford between 1<sup>st</sup> and 7<sup>th</sup> streets that border the MBTA Orange Line and Commuter Rail corridor.

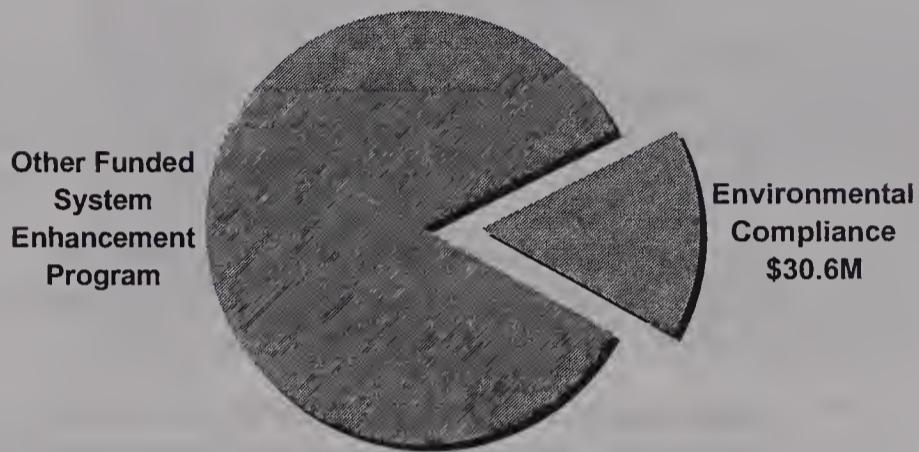
#### Braintree Noise Wall

This project involves the design and construction of a noise wall for residences in Braintree.

#### Fellsway Bus Garage Remediation

This project involves the construction of a trench around the Fellsway property. This will allow for the containment, removal and disposal of contaminated soil around the Fellsway site.

Funded System Enhancement Program = \$192.2 Million



### **Mattapan/Codman Yard Compliance**

The project is installing an oil water separator and constructing a canopy over the outdoor maintenance pits to prevent pollutants being discharged from the Mattapan Carhouse directly into the Neponset River. This project will also remediate water discharge issues at Codman Yard in Dorchester.

### **Underground Storage Tank Removal—Phase I**

The project includes removal of existing underground tanks, installation of new underground storage tanks, installation of new above ground storage tanks, piping and control systems, retrofitting existing underground storage tanks and installation of fire protection systems. The scope is inclusive of all 135 underground storage tank (UST) systems at 37 MBTA facilities and is nearly complete.

### **Bus Wash Upgrades**

In compliance with the Clean Water Act, the Authority's will install new washing equipment in all bus garages. This equipment will recycle water and reduce the volume of wastewater. This reduction will improve the ability of the water-oil separators to extract the heavy metals and petroleum byproducts, reducing the discharge to below permit levels.

### **South Boston Power Plant Phase I—Abatement**

The MBTA and the Attorney General have established a schedule for the abatement of asbestos and demolition of the South Boston Power Plant.

### **South Boston Power Plant Phase II—Demolition**

The MBTA and the Attorney General have established a schedule for the abatement and demolition of the South Boston Power Plant. Demolition cannot begin until the Phase I abatement work is complete.

### **Environmental Compliance Management Efforts (Task Order)**

The project involves the preparation of environmental remediation response documents and design remediation for oil and/or hazardous waste releases throughout the Authority, and provides environmental consulting services to audit.

### **Noise Mitigation Program**

The funding for this project has been set-aside for anticipated noise mitigation needs.

### **System Enhancement—Environmental Compliance: FY01 – FY06 Projects (\$ in Millions)**

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Gallagher Term. Remed'n	\$0.10	\$0.00	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Bus Op. Cleaning Repl.	\$0.15	\$0.00	\$0.15	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Wellington Noise Wall	\$1.36	\$0.00	\$1.36	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Braintree Noise Wall	\$0.47	\$0.00	\$0.47	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fellsway Bus Garage	\$0.86	\$0.22	\$0.50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Mattapan/Codman Compl	\$1.65	\$0.34	\$1.31	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Underground Tank Rem	\$5.10	\$4.63	\$0.47	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Bus Wash Upg	\$2.30	\$0.00	\$2.15	\$0.15	\$0.00	\$0.00	\$0.00	\$0.00	\$0.15	\$0.00
S. Bos. Pwr Plant-Ph. I	\$4.10	\$3.94	\$0.16	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
S. Bos. Pwr Plant-Ph. II	\$15.85	\$0.17	\$7.85	\$7.84	\$0.00	\$0.00	\$0.00	\$0.00	\$7.84	\$0.00
Environ Compl Mgt Eff.	\$13.36	\$8.81	\$2.73	\$1.07	\$0.75	\$0.00	\$0.00	\$0.00	\$1.82	\$0.00
Systemwide Noise Mit'n	\$6.30	\$0.00	\$1.27	\$0.00	\$0.00	\$0.00	\$0.00	\$2.24	\$2.24	\$2.79
<b>Total Program</b>	<b>\$51.60</b>	<b>\$18.12</b>	<b>\$18.51</b>	<b>\$9.06</b>	<b>\$0.75</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$2.24</b>	<b>\$12.04</b>	<b>\$2.79</b>

### **ANTICIPATED FUTURE EFFORTS**

There is one future effort that has been identified for environmental compliance.

#### **Fitchburg Roundhouse – Asbestos Abatement**

This project will remove and dispose of asbestos in the partially collapsed roundhouse at Fitchburg.



## PROGRAM OVERVIEW

The Authority is continually working to expand the scope of its services in order to offer public transportation to a larger segment of the greater Massachusetts population. Much of the system expansion work underway is included as mitigation under the State Implementation Plan (as developed under the Clean Air Act) or under the Central Artery Vent Certification (as issued by DEP in 1991).

Since 1985, the Authority has increased the number of revenue miles operated annually by 14 million miles. Much of this is due to large-scale system expansions including new commuter rail service to Worcester, Middleborough, Plymouth and Newburyport. The current program focuses on constructing the Silver Line to provide new service within Boston's urban corridor.

Over the next few years, new commuter rail stations will be opened along the Worcester line, the Old Colony line at JFK/UMass, and three new commuter rail branches are in the preliminary design phase, ultimately serving Scituate (Greenbush), Fall River and New Bedford. In 2002, the first section of the Authority's new Silver Line will open, with service between Dudley Square and Downtown Crossing.

MBTA Capital  
Improvement  
Program  
\$2.91B

Funded  
System Expansion  
Program  
\$842.0 Million

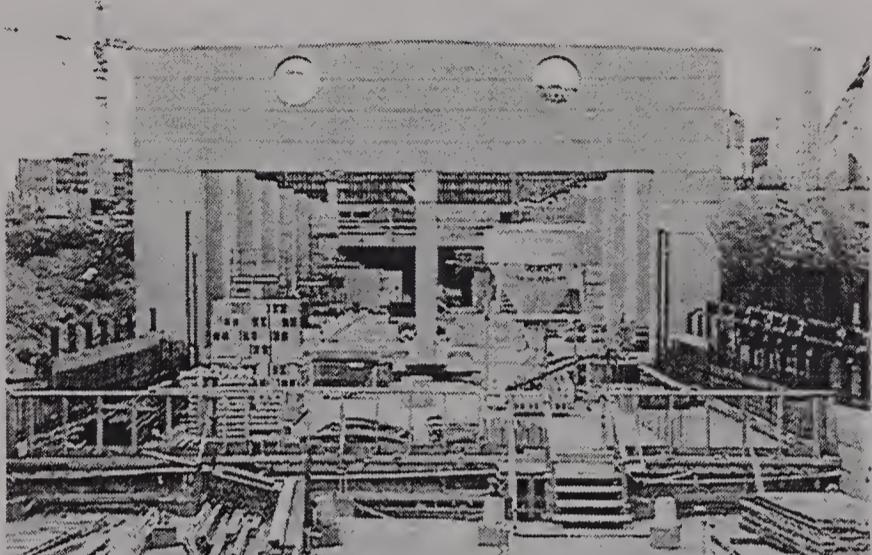
Studies/Dev  
\$10.2M

\$842.0M

Comm Rail  
\$469.8M

Silver Line  
\$361.2M

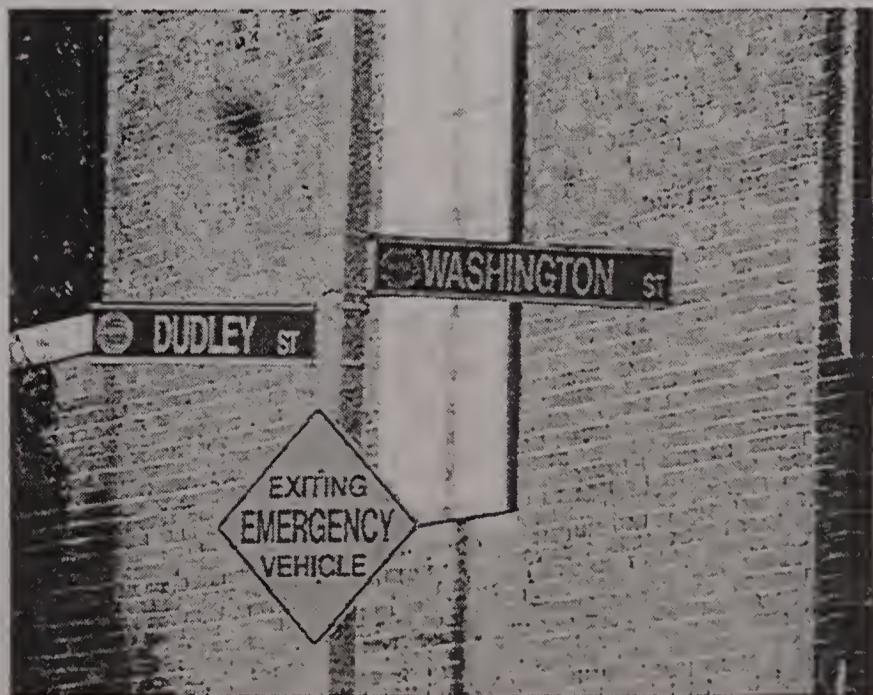
Bus  
\$0.8M



In 2003, a second section will open, providing service between South Station and the South Boston Waterfront.

Smaller scale evaluation studies of potential future expansions are also being performed, including the feasibility of constructing new stations or extending existing lines.

The current program devotes \$842.0 million towards system expansion. This represents 29.0% of the total capital investment program. Most of this effort is designated for the Silver Line and commuter rail expansion programs.







## SYSTEM EXPANSION SUBWAY

Currently, the Authority has no projects funded for subway system expansion. A proposed subway expansion effort is the extension of the Green Line to Somerville.

### FUNDED PROJECTS: FY01 - FY06

*Currently, there are no subway expansion projects programmed.*

### ANTICIPATED FUTURE EFFORTS

One project has been identified for subway expansion.

#### **Green Line Medford Extension**

Long range plans include extension of the Green Line from Lechmere Station to the vicinity of Tufts University in Medford.

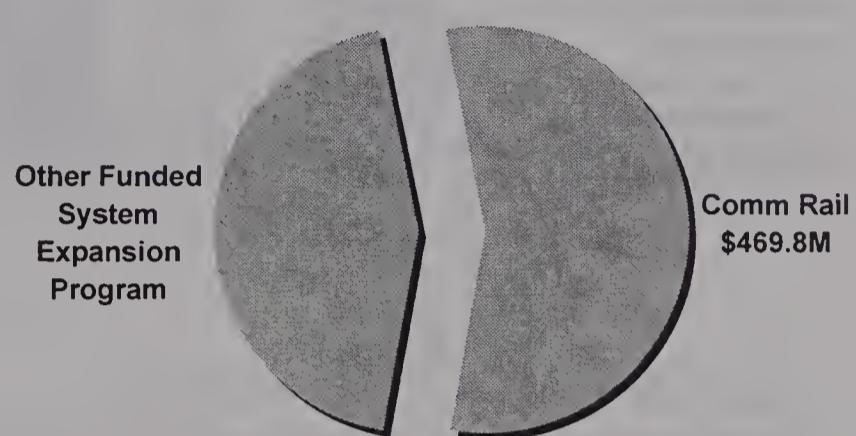




## SYSTEM EXPANSION COMMUTER RAIL

Funded System Expansion Program = \$842.0 Million

The current plan programs \$469.8 million toward the expansion of the commuter rail system. This represents 55.8% of the system expansion effort. The majority of the funding devoted toward commuter rail expansion is for the Greenbush project. Other major efforts include new stations on the Old Colony and Worcester lines, and the extension of service to New Bedford and Fall River. The useful lives of both stations and track work can be found in the Station and Track sections of this document, respectfully.



### FUNDED PROJECTS: FY01 - FY06

There are five funded projects underway for commuter rail system expansion. Two (Greenbush and Fall River/New Bedford) are early design efforts and three are construction projects. As the Authority continues its efforts to meet increasing demand for its services, operating costs will increase for operations and maintenance. Therefore, these efforts will have a negative impact on the Authority's operating budget.

#### Newburyport Extension

This represents the final efforts of the Ipswich to Newburyport extension, which opened in October 1998. Final work includes environmental items.

#### New Bedford/Fall River Extension - Phase I

This project includes design, construction to support the extension of MBTA services to New Bedford and Fall River. Current efforts include the rehabilitation of bridges in New Bedford and Fall River, design efforts south of Cotley, and preliminary design and EIR efforts north of Cotley.



#### Worcester Commuter Rail Extension

Remaining work consists of the construction of three (3) new commuter rail stations in Westborough, Southborough and Ashland. Completed work includes the construction stations in Worcester and Grafton, a layover facility, reconstruction of the Route 85 bridge, trackbed preparation, traffic mitigation and Conrail track and signal force account work.

#### Old Colony Line Rehabilitation: Middleborough and Plymouth

This represents the completion of final elements in support of the Old Colony lines that were reconstructed and opened for service in 1997.

#### Old Colony Greenbush Rehabilitation Project

The project consists of the rehabilitation of the Old Colony Greenbush Branch. The scope includes: construction of 17.1 miles of track, 7 stations, a layover facility, a tunnel through historic Hingham Square and the purchase of necessary rolling stock.

**System Expansion—Commuter Rail: FY01 – FY06 Projects (\$ in Millions)**

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Newburyport Ext'n	\$24.20	\$23.62	\$0.58	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
New Bedford/Fall River-Ph. I	\$45.98	\$13.62	\$17.07	\$15.29	\$0.00	\$0.00	\$0.00	\$0.00	\$15.29	\$0.00
Worcester Ext'n	\$97.81	\$71.41	\$15.07	\$8.93	\$2.40	\$0.00	\$0.00	\$0.00	\$11.33	\$0.00
Old Colony Line Rehab.	\$145.73	\$134.23	\$9.21	\$2.20	\$0.00	\$0.00	\$0.10	\$0.00	\$2.30	\$0.00
OCRR/Greenbush Ext.	\$408.70	\$9.72	\$4.20	\$28.09	\$52.83	\$98.84	\$180.58	\$34.45	\$394.78	\$0.00
<b>Total Program</b>	<b>\$722.42</b>	<b>\$252.59</b>	<b>\$46.13</b>	<b>\$54.49</b>	<b>\$55.23</b>	<b>\$98.84</b>	<b>\$180.68</b>	<b>\$34.45</b>	<b>\$423.69</b>	<b>\$0.00</b>

**ANTICIPATED FUTURE EFFORTS**

There is one project that has been identified as an anticipated future effort for commuter rail expansion.

**Yawkey Station**

This project involves the potential of full time service to a greatly enhanced Yawkey Station near Fenway Park along the Framingham line.

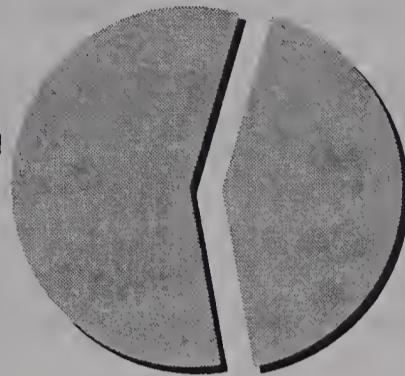


## SYSTEM EXPANSION SILVER LINE

Funded System Expansion Program = \$842.0 Million

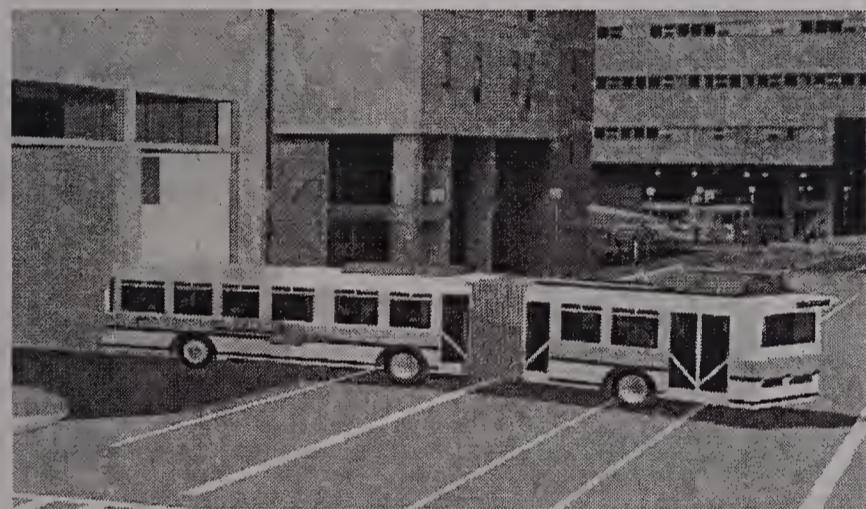
The MBTA is constructing a new line to operate as part of its core downtown transit system. This Silver Line will combine bus rapid transit services along Washington Street and the South Boston Piers Transitway into a single line. The new Silver Line will provide connections between residential neighborhoods and job centers in the Financial District and the new South Boston Waterfront. The service will also be coordinated with Massport to provide service to Logan Airport.

Other Funded  
System  
Expansion  
Program



Silver Line  
\$361.2M

There are 13 Silver Line stations under construction. A total of 10 new stations along Washington Street will open in 2002. This line will terminate at the existing Dudley Station in Roxbury. Three additional Silver Line stations along the South Boston Piers Transitway will open in 2003.



Vehicle procurement for Washington Street and the South Boston Piers Transitway are underway and handled under the Revenue Vehicle program.

The current plan programs \$361.2 million toward Silver Line system expansion. This represents 42.9% of the system expansion effort. The majority of this effort is devoted towards Phase I of the South Boston Piers Transitway project. The useful lives of both stations and tunnels can be found in the Station and Facilities portions of this document, respectively.

### FUNDED PROJECTS: FY01 - FY06

There are four efforts currently related to Silver Line system expansion. One is related to Washington Street, two projects are related to the South Boston Piers Transitway and the fourth is conceptual planning to eventually connect the two. These efforts will have a negative impact on the Authority's operating budget. The installment of the Silver Line will lead to higher operating costs for operations and maintenance.

#### Washington Street Replacement Service

The Washington Street Replacement Service contract is a joint project with the Massachusetts Highway Department (MHD) for the design and reconstruction of Washington Street from Dudley Station to downtown. The MBTA is responsible for the design of the project and the costs of all transportation elements such as station structures; work will include full depth construction from building edge to building edge. A \$17.0 million budget for vehicle acquisition is included under the Revenue Vehicle program.

#### South Boston Transitway—Phase I

This is a one-mile long tunnel extending from South Station to the pier's area with 3 stations: South Station, Courthouse Station, and World Trade Center Station. A \$31.7 million budget for vehicle acquisition is included under the Revenue Vehicle Program. A maintenance facility on South Hampton street for these vehicles is also funded by this line item.

#### South Boston Transitway—Phase I Reserve

This funding represents a contingency budget, set as a placeholder in the plan, to ensure that the Authority has sufficient financial capacity to fully fund the Transitway project.

### South Boston Transitway—Phase II Conceptual Planning

Phase II of the Silver Line will connect Washington Street to South Station and Logan Airport. This effort will initiate Phase II design.

#### System Expansion—Silver Line: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Wash. St. Repl. Srvce	\$12.00	\$3.90	\$2.86	\$3.44	\$1.80	\$0.00	\$0.00	\$0.00	\$5.24	\$0.00
S. Bos Tran—Ph. I	\$558.90	\$263.07	\$111.68	\$108.20	\$54.72	\$19.38	\$1.84	\$0.00	\$184.15	\$0.00
S. Bos Tran—Ph. I Rsrv	\$50.00	\$0.00	\$0.00	\$0.00	\$0.00	\$25.00	\$25.00	\$0.00	\$50.00	\$0.00
S. Bos Tran—Ph. II Dsn	\$7.33	\$0.03	\$3.54	\$3.65	\$0.12	\$0.00	\$0.00	\$0.00	\$3.76	\$0.00
<b>Total Program</b>	<b>\$628.23</b>	<b>\$267.00</b>	<b>\$118.08</b>	<b>\$115.29</b>	<b>\$56.63</b>	<b>\$44.38</b>	<b>\$26.84</b>	<b>\$0.00</b>	<b>\$243.15</b>	<b>\$0.00</b>

### ANTICIPATED FUTURE EFFORTS

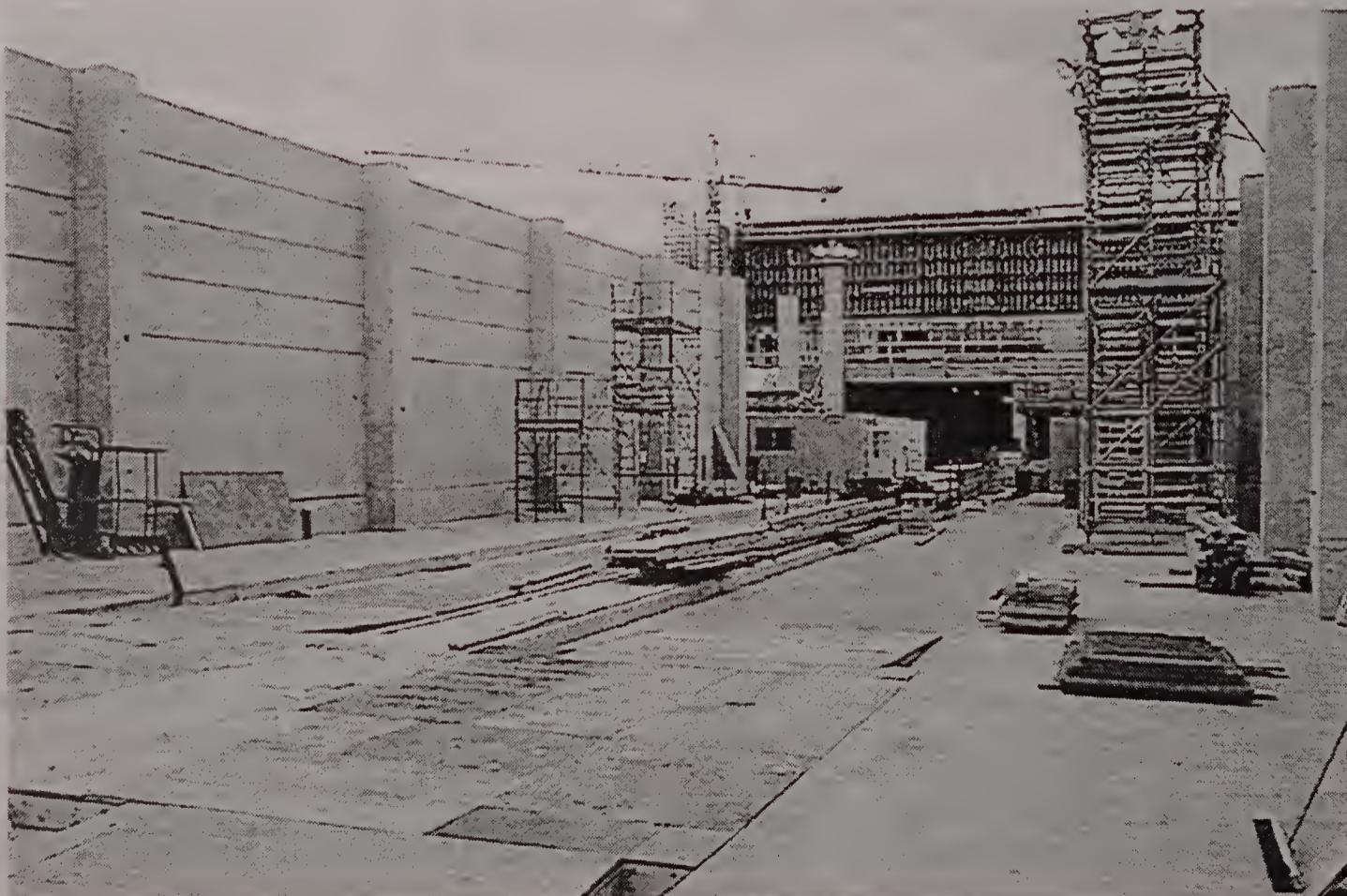
The following projects have been identified as future efforts under Silver Line expansion.

#### Silver Line Phase II

This effort will continue design and construction for Phase II initiated above. This would involve the construction of a tunnel between South Station and Boylston Street, and between Boylston and New England Medical Center. The cost has been estimated to approximately \$720 million. This will complete the Silver Line project.

#### Silver Line – Additional Studies

This effort would involve analysis and evaluation of potential further expansion of the Silver Line system south of Dudley Square.





## SYSTEM EXPANSION BUS

The current plan programs \$770,000 toward the expansion of the bus system. This represents less than 1.0% (0.1%) of the system expansion effort.

### FUNDED PROJECTS: FY01 - FY06

Currently, there is one funded project for bus system expansion. This project will have a negative impact on the Authority's operating budget due to higher operating costs that will lead to increases in operations and maintenance. The useful life information for stations can be found in the Station section of this document.

#### South Station Bus Terminal

This represents the final efforts under the \$86.6 million project to construct the South Station Bus terminal and parking garage.

#### System Expansion – Bus: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
S. Stn Bus Terminal	\$86.64	\$85.11	\$0.77	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Program</b>	<b>\$86.64</b>	<b>\$85.11</b>	<b>\$0.77</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>

### ANTICIPATED FUTURE EFFORTS

There is one anticipated future effort listed for bus expansion.

#### Circumferential Transit Bus Routes

This project involves the implementation of new bus routes serving institutions and communities outside the downtown Boston core.





MBTA  
FY01 - FY06

Capital Investment Program

STUDIES/DEVELOPMENT

SYSTEM EXPANSION

## SYSTEM EXPANSION STUDIES/DEVELOPMENT

The Authority is continually investigating the feasibility, the cost and the benefits of a variety of potential future expansion projects. These efforts may include large scale Major Investment Studies (MIS) in accordance with federal planning requirements, as well as smaller, localized studies to determine the impact of a new station. Also included under this section are the systemwide modeling and planning efforts conducted to identify and prioritize expansion needs. Useful life information is irrelevant for studies and development.

The current plan programs \$10.2 million toward the studies and system development. This represents 1.2% of the system expansion effort.

### FUNDED PROJECTS: FY01 - FY06

There are currently five projects under studies and development system expansion. These efforts will have a neutral impact on the Authority's operating budget.

#### Program for Mass Transportation Update (PMT)

The PMT evaluates the costs and benefits of a variety of system expansion and enhancement opportunities. This effort consists of work with Central Transportation Planning Staff (CTPS) to develop a long-range plan of mass transportation improvements. The PMT was last updated in 1993.

#### North Shore Major Investment Study (MIS)

Congress has appropriated \$1 million in T-21 funding to evaluate transportation needs for the North Shore. This is being used to initiate a Major Investment Study (MIS), or evaluation of alternatives. The total cost of such an effort, including environmental analysis, is estimated to be in the range of \$4 to 5 million. The current appropriation of \$1million will fund several components of the study including gathering information, initiating a comprehensive public involvement effort, and identifying long- and short-term transportation needs in the corridor.

#### Unified Planning Work Program (MAPC)

This program funds various planning efforts regarding development of the MBTA system.

#### North-South Rail Link

This project funds the study of linking North Station to South Station to provide commuters easier access to the financial district.

#### Circumferential Transit/Urban Ring MIS Study

The Urban Ring study is a federally funded Major Investment Study to evaluate and develop circumferential transit services to better access activity centers located just outside the central core.

### System Expansion—Studies/Development: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
PMT Update 2001	\$0.60	\$0.00	\$0.40	\$0.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.20	\$0.00
North-South Rail Link	\$0.62	\$0.00	\$0.40	\$0.22	\$0.00	\$0.00	\$0.00	\$0.00	\$0.22	\$0.00
N. Shore MIS	\$3.72	\$0.00	\$0.96	\$1.51	\$0.50	\$0.75	\$0.00	\$0.00	\$2.76	\$0.00
UPWP/MAPC	\$3.80	\$2.61	\$0.48	\$0.18	\$0.18	\$0.18	\$0.18	\$0.00	\$0.71	\$0.00
CT/Urban Ring	\$6.02	\$1.98	\$0.51	\$0.61	\$0.69	\$0.86	\$0.86	\$0.50	\$3.52	\$0.00
<b>Total Program</b>	<b>\$14.75</b>	<b>\$4.60</b>	<b>\$2.74</b>	<b>\$2.71</b>	<b>\$1.37</b>	<b>\$1.79</b>	<b>\$1.04</b>	<b>\$0.50</b>	<b>\$7.41</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE EFFORTS

The following project has been identified as a future effort for studies and development.

### Systemwide Surveys/Planning

This funds miscellaneous efforts to support the development of system expansion projects. Included are ridership forecasts, passenger counts and other studies. The data received will provide the Authority information for determining the benefit of future expansion efforts.

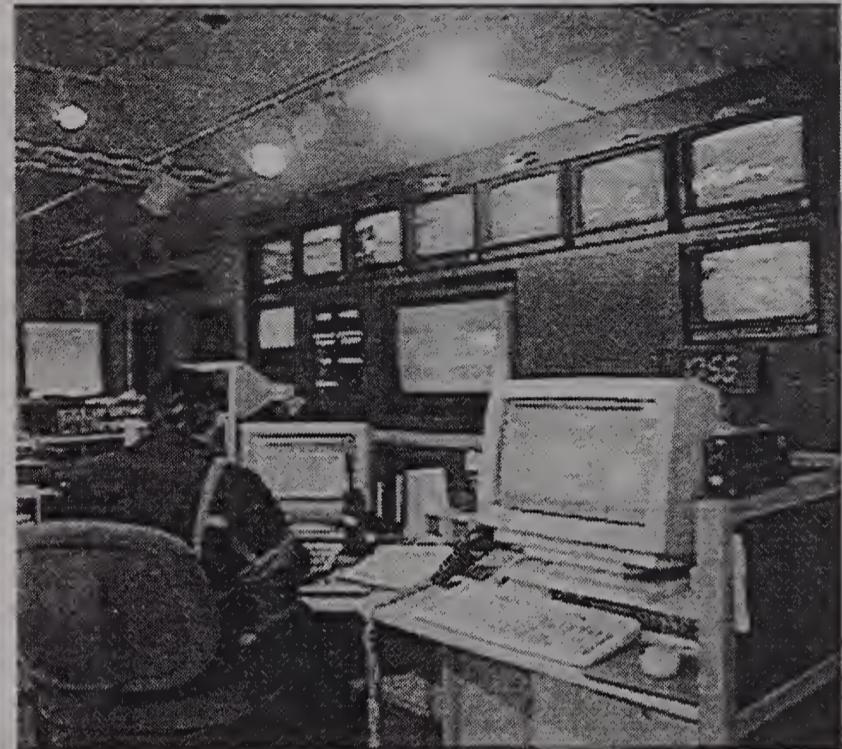


## PROGRAM OVERVIEW

As with any large organization, the Authority assumes a cost to conduct business. The Authority must provide administrative offices and a working environment equipped with computers, phones furniture and the necessary systems and support services to carry out their responsibilities effectively and efficiently. Also included are the costs required to support administration of the capital program. These include the cost of bond issuance as well as engineering support services.

Much of the MBTA's computer equipment (PCs, printers, etc.) was upgraded as part of the year 2000 program. The Authority has one enterprise server (mainframe) that services the MBTA's computer network supporting over 2000 external devices. The server is assigned a 6-year useful life. The Authority has 1500 computers systemwide, which are impacted directly by the advances in technology. They have a useful life of 3 years. The police department also has 117 computers, each having a useful life of 5 years.

The current plan programs \$14.9 million towards administration and other support efforts. The Administration program represents less than 1.0% (0.4%) of the total capital investment program.



## **FUNDED PROJECTS: FY01 - FY06**

There are eight funded projects for administration/other program. These efforts will have a positive impact on the Authority's operating budget. Many of these projects will allow the MBTA to operate more efficiently and effectively (Year 2000 Program, State of Good Repair), thus reducing costs and allowing the Authority to provide better service throughout its system.

### **Year 2000 Program**

This project encompassed a variety of separate efforts to eliminate potential failures due to the millennium date transaction. Phase I was a multi-tasked \$6 million effort, including inventory and assessment of Authority computer assets (including imbedded processors) and updated (replaced) the mainframe. Phase II was the remediation effort identified as a result of Phase I. Final training on various products and program upgrades will be completed in FY01.

### **Financial Management System**

This effort funds the installation and implementation of an upgraded financial management and accounting system.

### **Centralized Employee Tracking**

This program involves the implementation of PeopleSoft Human Resource software to provide centralized employee tracking data and functionality as well as adding components to effect implementation of a comprehensive human resource system.

### **Miscellaneous Grant Initiatives**

The project uses miscellaneous grant funding on to close out specific projects.

### **State of Good Repair/Independent Engineering Service**

The state of good repair effort funds an inventory of all MBTA capital assets, an assessment of their condition, and the establishment of a database to prioritize infrastructure reinvestment. Independent Engineering Consultant services are being used to support the Capital Management Group and its oversight of project management issues, capital program policy and capital dollar allocation.

### **Independent Engineering Review—All**

This task order contract represents various planning and construction tasks that will be utilized accordingly by the Authority. The FTA requires that a value engineering study be performed for all the major projects that are federally funded. Other task orders include: a task order contract used to comply with Massachusetts Building Code; and a task order contract used to produce survey maps to support in-house design efforts, perform subsurface testing, soil borings and archeological surveys, and develop data for conservation commission submissions.

### **EOTC Transit Program**

This effort contributes to the transit program managed by EOTC.

### **FY01-06 Technology Improvements**

The Authority needs to increase its data storage capacity, upgrade its software environment (move to UNIX), replace the CPU by 2003, expand the WAN/LAN to remote locations, purchase additional servers, and continue to replace PC's on a regular basis. These efforts reflect increasing demand for electronic data interchange and demand for broader access to data across the Authority as the result of new and upgraded programs and ongoing network access expansion.

### **Bond Issuing (including DBE)**

This represents the Authority's cost of bond issuance.

Administration/Other: FY01 – FY06 Projects (\$ in Millions)

PROJECT	Authorized Budget	Expended 6/00	FY01	FY02	FY03	FY04	FY05	FY06	Total FY02-FY06	Beyond FY06
Y2K Pgm-Ph. I & II	\$13.25	\$11.94	\$0.30	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Financial Mgmt System	\$7.98	\$7.56	\$0.42	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Centralized Empl. Trkng	\$4.60	\$4.15	\$0.45	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
State of Good Repair	\$1.80	\$1.07	\$0.50	\$0.15	\$0.08	\$0.00	\$0.00	\$0.00	\$0.23	\$0.00
Misc/ FY01 Project Closeout	\$1.00	\$0.00	\$0.83	\$0.17	\$0.00	\$0.00	\$0.00	\$0.00	\$0.17	\$0.00
EOTC Tran Prgrm	\$15.40	\$13.38	\$0.42	\$0.40	\$0.40	\$0.40	\$0.40	\$0.00	\$1.60	\$0.00
Indep. Engin. Review (IER)	\$1.58	\$0.48	\$0.30	\$0.35	\$0.35	\$0.10	\$0.00	\$0.00	\$0.80	\$0.00
FY99-02 Tech. Improv.	\$7.00	\$2.91	\$0.64	\$0.65	\$0.70	\$0.70	\$0.70	\$0.70	\$3.45	\$0.00
Bond Issuing (incl. DBE)	\$11.70	\$6.91	\$1.02	\$0.78	\$0.80	\$0.82	\$0.83	\$0.55	\$3.77	\$0.00
<b>Total Program</b>	<b>\$64.30</b>	<b>\$48.39</b>	<b>\$4.87</b>	<b>\$2.50</b>	<b>\$2.33</b>	<b>\$2.02</b>	<b>\$1.93</b>	<b>\$1.25</b>	<b>\$10.02</b>	<b>\$0.00</b>

## ANTICIPATED FUTURE EFFORTS

The following have been identified as future efforts for administration/other.

### Data Storage Capacity Upgrade

The purpose of this project is for the purchase of additional equipment for the main data center. This upgrade will allow the Authority to replace outdated equipment with current technology, as well increase data storage capacity required by the increasing number of automation applications in broader use throughout the Authority.

### Miscellaneous Capital Projects

This is a general grant composed of multiple projects throughout the Authority. Included in this grant are allocations for truck lifts, wheel truing machines, and other capital equipment. Also included is the Automatic Data Collection (ADC) initiative by Materials Management.

### Capital Program Support (FY01)

This represents administrative support functions for the MBTA's capital program.

### Technology Improvements

This effort also funds the replacement and upgrade of personal computers at the Authority.







**Massachusetts Bay Transportation Authority**  
10 Park Plaza ♦ Boston, MA 02116